Ministry of Health
The Republic of Tajikistan

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR IMPROVEMENT OF MEDICAL EQUIPMENT AND WATER SUPPLY AND DRAINAGE FACILITIES FOR MATERNAL AND CHILD HEALTH CARE INSTITUTIONS
IN
THE REPUBLIC OF TAJIKISTAN

February 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

FUJITA PLANNING CO., LTD.
DAIKEN SEKKEI, INC.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey on the Project for Improvement of Medical Equipment and Water Supply and Drainage Facilities for Maternal and Child Health Care Institutions in the Republic of Tajikistan and entrust the survey to consist of Fujita Planning Co., Ltd. and Daiken Sekkei Inc. The survey carried out from August 8 to September 7, 2012.

The survey team held a series of discussions with the officials concerned of the Government of Tajikistan, and conducted a field investigation. After the further studies in Japan, a mission was sent to Tajikistan in order to discuss a draft outline design from December 16 to 30, 2012. As this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Tajikistan for their close cooperation extended to the survey teams.

February, 2013

Nobuko Kayashima
Director General, Human Development Department
Japan International Cooperation Agency

SUMMARY

SUMMARY

1. Overview of the Country

The Republic of Tajikistan ("Tajikistan") is a landlocked nation in the southern part of Central Asia that shares its eastern border with the People's Republic of China ("China"). It borders Kyrgyzstan to the north, Uzbekistan to the west and Afghanistan to the south. Most of Tajikistan's terrain is mountainous; its eastern part includes the Pamir Mountain Range all the way to its border with China, and the Fergana Valley in its northern reaches stretches to its borders with Uzbekistan and Kyrgyzstan.

The population of Tajikistan is around 7 million people (2011, United Nations Population Fund) and its total land area is about 40% that of Japan at around 1.43 million square kilometers.

A continental climate prevails over the Tajik capital of Dushanbe, in which Maternity Hospital No. 3 is located, and the southern Tajik province of Khatlon, in which Khatlon Oblast Provincial Hospital and central district hospitals and number hospitals selected for projects targeted by this cooperation are located. The climate is characterized by hot, dry weather with high temperatures over 35ºC from June through September and an average temperature below freezing from December through February with some areas receiving snowfall.

Tajikistan was one of the poorest nations of the former Soviet Union, and its people suffered a widespread deterioration of their standard of living as the country's socioeconomic circumstances continued to get worse during the conflict following its independence. Later, it recovered from civil war with the help of various international organizations, and its economic circumstances began to improve slightly when citizens traveled to Gulf countries, Russia and other neighboring countries to work. However, the unemployment rate is still high and the economic situation is still stringent. Since the global financial crisis hit in October 2008, economic recession in Russia and Kazakhstan, both of which have deep economic connections to Tajikistan, and decreased transfers of money back to Tajikistan from migrant workers have pushed the country's GNI per capita down to 780 U.S. dollars in 2011 (2011, World Bank). As it stands now, Tajikistan is receiving cooperation from the International Monetary Fund (IMF), World Bank (WB) and other international organizations and requires outside assistance for economic development.

Principal industries in Tajikistan are cotton growing and other types of farming and cattle breeding, and in the industrial sector, the textile industry is relatively developed. Tajikistan also features small deposits of zinc, tin, uranium, radium, bismuth and other rare metals. Tajikistan introduced its own currency, the Tajikistan Ruble, on 10 May 1995 but changed to the Tajikistan Somoni (TJS) in October 2000. Primary, secondary and tertiary industries make up 17.0%, 33.5% and 49.5% of industry, respectively.[1]

2. Background of the Project

Compared to its Central Asian neighbors, Tajikistan has the second-highest maternal mortality rate next to that of Kyrgyzstan (64 per 10,000 births) and the highest neonatal mortality rate (25 per 1,000 births), infant mortality rate (52 per 1,000 births) and under 5 mortality rate (63 per 1,000 births); it markers for

[1] Tajikistan in Figures 2011, Agency on Statistics Under President of the Republic of Tajikistan.

maternal and child health are alarmingly high among countries in Central Asia (The State of the World's Children 2012, UNICEF).

These figures are due in part to the majority of its medical facilities and equipment built and procured under the former Soviet Union in the 1970s and 1980s. Maternity Hospital No. 3 in Dushanbe, provincial and district-level obstetric and neonatal / infant care facilities, and core facilities for providing maternal and child health services have difficulty providing appropriate services because facilities are in very poor condition and falling apart. In terms of infrastructure the power supply and water supply and drainage facilities are fast deteriorating and this is a major issue amongst various efforts to improve the maternal and child health care in Tajikistan.

Under those circumstances, the Tajikistan government established the National Development Strategy of the Republic of Tajikistan for 2006-2015 ("NDS"), and in 2011 it developed the National Health Strategy for the Republic of Tajikistan for 2011-2020 ("NHS") as part of the NDS for the health sector.

NHS focuses on providing citizens with widespread, consistent maternal and child health services in the form of pre- and post-natal care, neonatal care and comprehensive management of infant illnesses. In addition, improving the regional health care by improving the hospitals infrastructures (core hospitals in the capital of Dushanbe and the heavily populated capital of Khatlon Province) is seen as the most urgent needs toward improving the hospital system.

However, Tajikistan suffers a lack of funding for the expensive undertaking of improving facility infrastructure and has had difficulty moving forward according to plans. In that light, the government of Tajikistan requested grant aid in September 2011 for 1) around 180 units of medical equipment related to maternal and child care services at Maternity Hospital No. 3 in Dushanbe and Khatlon Oblast Provincial Hospital and six number hospitals in Khatlon Province for medical equipment improvement; and 2) water supply and drainage facility improvement for two central district hospitals (Jomi and Shartuz) and number hospitals in four districts (Jomi, Shartuz, Rumi and Vakhsh) in Khatlon Province.

The Japan International Cooperation Agency ("JICA") responded to this request by investigating the necessity and relevance of the matter requested and sent a Preparatory Survey Team to Tajikistan from early August to early September 2012 to clarify the nature and scale of facilities subject to survey.

The survey assessed that improving maternal and child care services through the plan interventions and improvements to core hospital facility infrastructure in heavily populated Dushanbe and Khatlon Province was the most urgent needs and was already under way. Also, the Japanese technical cooperation project for developing the skills of the medical workers and improving maternal and child health in Khatlon Province planned to last four years beginning in March 2012, "Project for Improving Maternal and Child Health Care System in Khatlon Oblast Province", is being implemented, and projects targeted by this cooperation are recognized as contributing to synergy with the aforementioned technical cooperation project.

Medical equipment will be improved in Maternity Hospital No. 3 in Dushanbe and Khatlon Oblast Provincial Hospital and five number hospitals in three districts (Jomi, Rumi and Shartuz) in Khatlon Province, and water supply and drainage facilities will be improved in two central district hospitals (Jomi and Shartuz) in Khatlon. In addition to said improvements to target facilities, medical equipment and water supply and drainage facilities, soft components for strengthening medical equipment operation and management will also be carried out. Target sites for medical equipment improvement were selected such

that medical facility infrastructure would be improved, and facilities where medical needs could be determined and that had appropriate medical worker staffing were given priority. Target sites for water supply and drainage facility improvement were selected such that they would be able to secure water sources from within facilities, and only facilities that satisfied drinking water quality standards set forth by Tajikistan and WHO were selected as targets.

3. Outline of the Results of the Field Survey and the Contents of the Project

The Survey Team reviewed and discussed the nature of the requests with the Ministry of Health in Tajikistan (the governing and responsible agency of the Tajikistan-side) and the nine sites (implementing agencies). In addition, the team assessed and investigated site status surveys, equipment and water supply and drainage facilities and drafted the improving design. The team organized the content of that draft into a draft Preparatory Survey Report and held briefings and discussions on site with the Tajikistan-side project related personnel from 16-30 December 2012.

Discussions revealed that the Ventilator (one unit for infant) at Maternity Hospital No. 3 in Dushanbe, at which plans were difficult because medical staff able to use existing and other equipment could not be determined, was a deteriorating piece of existing equipment that was being repaired so that it could be used. However, since the team was able to confirm the presence of physicians and nurses at that hospital able to operate and maintain the equipment, a Ventilator to replace the existing unit was included in the plan. The Ministry of Health in Tajikistan and related personnel at target medical institutions consented to all other content of the draft Preparatory Survey Report. This Preparatory Survey Report was prepared on the strength of the results of the aforementioned survey and discussions.

3.1 Basic Policy

This Project strives to improve hospital environments and, in so doing, help improve maternal and child health services at target hospitals through facility infrastructure (medical equipment and water supply and drainage facilities) improvement projects and support for improving operation, maintenance and technical skills for medical equipment through soft components at Maternity Hospital No. 3 in Dushanbe and Khatlon Oblast Provincial Hospital, two central district hospitals and five number hospitals in Khatlon Province.

3.2 Basic Plan of the Medical Equipment

Table 1 shows the main planned equipment.

Table 1　Major Equipment for Target Facilities

Table 1.1　Maternity Hospital No. 3 in Dushanbe

Department	Equipment
Operating Room equipment	Anesthesia apparatus, operating table, operating light, electrosurgical unit, patient monitor, suction unit, etc.
ICU equipment	Patient monitor, ventilator (for adults, for infants), oxygen

	concentrator, infusion pump, syringe pump, defibrillator, ultrasound scanner, etc.
NICU equipment	Infant warmer, infant incubator, phototherapy unit, infant monitor, etc.
Laboratory equipment	Spectrophotometer, microscope, autoclave, etc.
Ward equipment	Bed (for adults, for infants), cot, stretcher, etc.

Table 1.2 Khatlon Oblast Provincial Hospital

Department	Equipment
Pediatric Ward	Infant warmer, infant incubator, phototherapy unit, pulse oximeter, oxygen concentrator, infusion pump, infant monitor, suction unit, ventilator (for infants), nebulizer, ultrasound scanner, bed (for adults, for infants), cot (for infants), generator (25 kVA), etc.

Table 1.3 Five Number Hospitals

Department	Equipment
General Care Ward	Gynecological examination table, bed (for adults, for infants), cot (for infants), scale (for adults, for infants), stethoscope, examination light, fetal doppler (manual), delivery instrument set, hot air sterilizer, generator (10 kVA), etc.

3.3 Basic Plan of the Water Supply and Drainage System

Main plans for these facilities are as follows.

Table 2 Plan of the Improvement for Water Supply and Drainage Facilities

Facility Name	Improve/Build	Area	Qty.	Notes
Shartuz Central District Hospital				
Obstetric / Pediatric Ward: water supply facility	Improve	3,767.4 ㎡	One	Intake from existing distribution pipe on site (municipal water)
Obstetric / Pediatric Ward: water discharge facility	Improve	Same as above	One	To catch-basin around ward
Elevated tank	Build	20.6㎡	One	Tank capacity: two three-ton tanks Tank height: 15.5 meters
Pump room	Build	42.0㎡	One	Lifting pumps: two
Jomi Central District Hospital				
Pediatric Ward: water supply facility	Improve	2,530.06㎡		Intake from existing deep well on site
Pediatric Ward: water discharge facility	Improve	Same as above		Includes (new) septic tank
Obstetric Ward: water supply facility	Improve	2,074.84㎡		Intake from existing deep well on site

Facility Name	Improve/Build	Area	Qty.	Notes
Obstetric Ward: water discharge facility	Improve	Same as above		Includes (new) septic tank
Elevated tank	Build	12.05㎡		Tank capacity: one three-ton tank Tank height: 15.5 meters
Receiving tank / pump room	Build	96.0㎡		Receiving tanks: two three-ton tanks Well pumps: two Lifting pumps: two
Khatlon Oblast Provincial Hospital				
Pediatric Ward: emergency lighting / power outlets	Build	2,576.29㎡		
Generator room	Build	6.60㎡		

4. Implementation Schedule and Cost Estimation

This Project should take six (6) months for detailed design and tender process, and thirteen (13) months to manufacture, procure and install equipment and build / rehabilitate the water supply and drainage facilities. It is worth noting that the soft components involving on-site work done in an effort to improve medical equipment operation and maintenance will be implemented twice following the contracts by two parties; the Ministry of Health in Tajikistan and the Equipment Supplier, and the installation, test-run and hand over of the equipment to be procured. All of the activities related with the Assistance Project would be implemented within 13-month period. In total, the Assistance Project will require a schedule of around nineteen (19) months. The cost of the Assistance Project should be JPY 608 million (of which the Japanese side pays JPY 606 million and the Tajikistan side pays JPY 2 million).

5. Project Evaluation

(1) Relevance

This Project is to be implemented as a Japanese grant aid project, and it is deemed to be relevant for the following reasons.

1) Targeted Beneficiaries

The city of Dushanbe and Khatlon Province, the targets for this matter, have populations of 700,000 people and 2.7 million people, respectively (around 36% of the total population, 2009), and Khatlon Province is the most populous of the three provinces in Tajikistan. Also, the Japanese technical cooperation project for developing medical workers and improving maternal and child health in Khatlon Province planned to last four years from March 2012 (Project for Improving Maternal and Child Health Care System in Khatlon Oblast) is being implemented, and this Project contributes to synergy with the aforementioned technical cooperation project. Maternity Hospital No. 3 in Dushanbe is one of the top referral hospitals in the city and also functions as a teaching hospital where training and such are administered for the medical workers of Khatlon Province.

2) Project Goal

This Project strives to improve hospital environments and, to help improve maternal and child health services at target hospitals by improving medical equipment, and water supply and drainage facilities at Maternity Hospital No. 3 in Dushanbe and Khatlon Oblast Provincial Hospital, central district hospitals and number hospitals in Khatlon Province. The Project is expected to help improve and bring stability to people's lives and ensure that basic human needs (BHN) are met consistently.

3) Consistency with Tajikistan National Population Health Strategy

The National Development Strategy of the Republic of Tajikistan for 2006-2015 ("NDS") was established, and in 2011, the National Health Strategy for the Republic of Tajikistan for 2011-2020 ("NHS") was developed as part of NDS.

NHS focuses on providing citizens with widespread, consistent maternal and child health services in the form of pre- and post-natal care, neonatal care and comprehensive management of infant illnesses. In addition, improving hospitals critical to regional health care (improving and upgrading Khatlon Oblast Provincial Hospital and other core hospitals in the capital of Dushanbe and Khatlon Province) is seen as the most urgent needs toward modernizing the hospital system. Projects targeted by this Assistance Project by which medical equipment is procured, and water supply and drainage facilities are rehabilitated are consistent with these policies.

4) Consistency with Japanese Aid Policy

According to the aid policy for Tajikistan set forth by the Japanese government in December 2012, the stability of Tajikistan is critical not only to the stability of Central Asia but also to the stability of all of Eurasia, and it is absolutely vital for efforts to form a global society with the aim of independence and stability for neighboring Afghanistan. With the realization that water supply, health care and other basic social service sectors have not been sufficiently established, this Assistance Project supports the establishment of water supply and drainage facilities that provide access to safe, clean drinking water and of health care systems (maternal and child health care, first and foremost) as one critical area (medium-term goal). Thus, this Assistance Project is consistent with Japanese aid policy.

(2) Effectiveness

Implementing this Project should deliver the following results.

1) Quantitative Effects

Table 3　Guidelines Indicating Achievement of Overall Project Goals

Table 3.1 Maternity Hospital No. 3 in Dushanbe

Guideline	Baseline (2011)	Target (2017) (three years after project completion)
Deliveries	6,138	6,775 (Note 1)
Inpatient newborns	6,427	7,039 (Note 2)

Obstetric surgeries	561	607 (Note 3)
Neonatal mortality rate (0-7 days after birth)	1.29%	Below 1.00% (Note 4)
Ultrasound examinations	5,823	7,633 (Note 5)
Referrals to other medical institutions	86	Reduced

Note 1: Expected figure for implementation of projects targeted by this Assistance Project (1.2%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.5%; this rate was applied to the baseline through 2017.

Note 2: This is the total number of newborns born within the hospital and those accepted from outside the hospital. Expected figure for implementation of projects targeted by this Assistance Project (1.0%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.3%; this rate was applied to the baseline through 2017.

Note 3: No major changes were seen in the number of surgeries between 2009 and 2011, so the figure of 561 for 2011 was set as the baseline and only the expected figure for implementation of projects targeted by this Assistance Project (2.0%) was applied to the baseline through 2017.

Note 4: The percentage of deaths from the figures determined in Note 2.

Note5: Though fluctuations were observed between 2009 and 2011, the figure seems to be decreasing. Oral interviews clearly indicated that this is due to deteriorating equipment. Therefore, the expected figure for implementation of projects targeted by this Assistance Project (replacing deteriorating equipment) (annual growth rate through 2017) is set at 7.0%, and the goal is to recover the figures set in 2009 and 2010 (7,438 and 7,721, respectively).

Table 3.2 Khatlon Oblast Provincial Hospital (Pediatric Ward)

Guideline	**Baseline (2011)**	**Target (2017) (three years after project completion)**
Inpatients	2,710	3,074 (Note 6)
Infant/child mortality rate	1.4%	Below 1.0% (Note 7)
Ultrasound examinations	1,652	1,788 (Note 8)

Note 6: This is the total number of infants and children older than 30 days and younger than 15 years. Expected figure for implementation of projects targeted by this Assistance Project (2.0%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 3.3%; this rate was applied to the baseline through 2017.

Note 7: The percentage of deaths from the figures determined in Note 6.

Note 8: Expected figure for implementation of projects targeted by this Assistance Project (annual growth rate through 2017) was set at 2.0% and applied to the baseline.

Table 3.3 Central District Hospitals (2 Facilities)

Guideline	**Baseline (2011)**		**Target (2017) (three years after project completion)**	
	Jomi Central District Hospital	Shartuz Central District Hospital	Jomi Central District Hospital	Shartuz Central District Hospital
Deliveries	4,514	3,685	4,886 (Note 9)	3,989 (Note 9)
Pediatric inpatients	1,330	1,048	1,428 (Note 10)	1,126 (Note 10)
Percentage of water supplied within	-	-	100% (Note 11)	100% (Note 11)

the facility that satisfies water quality standards				

* Notice: This takes into account the synergistic effects of technical cooperation projects currently being implemented.

Note 9: Expected figure for implementation of projects targeted by this Assistance Project (2.0%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 3.3%; this rate was applied to the baseline through 2017.

Note 10: This is the total number of infants and children older than eight days and younger than 15 years. Expected figure for implementation of projects targeted by this Assistance Project (0.5%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 1.8%; this rate was applied to the baseline through 2017.

Note 11: Water quality standards are standards for drinking water set forth by Tajikistan and WHO.

Table 3.4 Number Hospitals (5 Facilities)

Guideline	**Baseline (2011)**	**Target (2017)** **(three years after project completion)**
Deliveries	1,652	1,823 (Note 12)
Pediatric inpatients	447	484 (Note 13)

* Names of the five Number Hospitals: J No. 1: Jomi No. 1 District Hospital; J No. 3: Jomi No. 3 District Hospital; R No. 1: Rumi No. 1 District Hospital; R No. 2: Rumi No. 2 District Hospital; S No. 3: Shartuz No. 3 District Hospital

Note 12: Expected figure for implementation of projects targeted by this Assistance Project (1.2%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.5%; this rate was applied to the baseline through 2017.

Note 13: Expected figure for implementation of projects targeted by this Assistance Project (0.7%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.0%; this rate was applied to the baseline through 2017.

2) Qualitative Effects

- Enables early detection and treatment of disorders of expectant and nursing mothers and newborn/pediatric illnesses.
- Improves working environment for medical workers, improves the quality of health care services for nursing and expecting mothers and newborns and children.
- The clinical training environment at Maternity Hospital No. 3, a critical hospital for such education training, is improved by the replacement and improvement of deteriorating medical equipment.
- The ability to consistently supply safe water throughout the year through the establishment of water supply and drainage facilities improves the hospital environment and the working environment for medical workers and improves the quality of health care services offered to patients.

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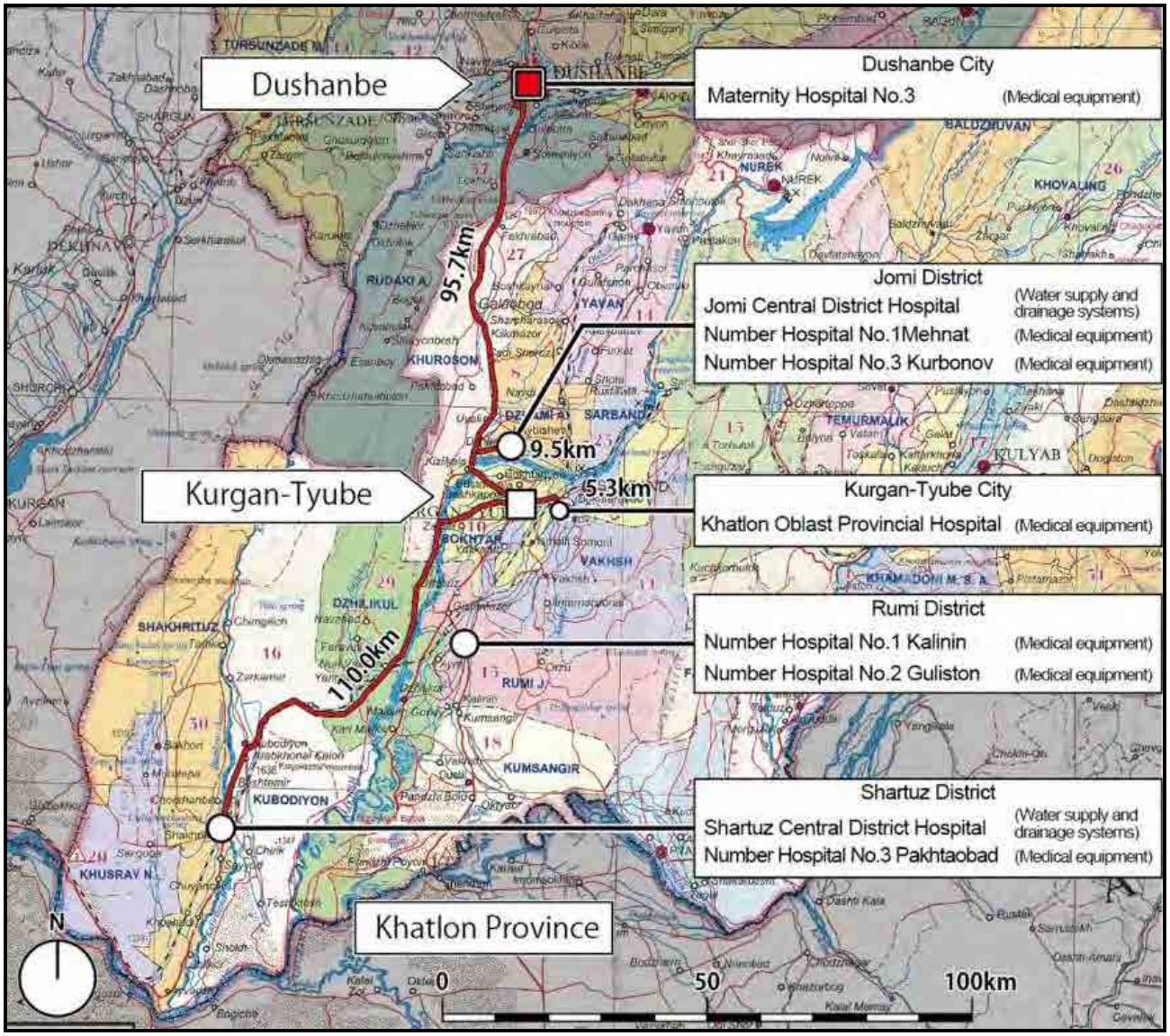
Appendices

LOCATION MAP



Artist's Rendering of the Water Supply Drainage Facilities
in the Central District Hospitals (Shartuz and Jomi)

LIST OF FIGURES & TABLES

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ABBREVIATIONS

A/P	Autorization to Pay
AVR	Automatic Voltage Regulator
AVS	Automatic Voltage Switcher
B/A	Banking Agreement
BHN	Basic Human Needs
CIS	Commonwealth of Independent States
DAC	Development Assistance Committee
E/N	Exchange of Notes
EU	Europian Union
G/A	Grant Agreement
NDS	National Development Strategy
NHS	National Health Strategy
ICU	Intensive Care Unit
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
JV	Joint Venture
KfW	Kreditanstalt für Wiederaufbau
NDS	National Development Strategy
NHS	National Health Strategy
NICU	Neonatal Intensive Care Unit
PPM	Planned Preventive Maintenance
TJS	Tajikistan Somoni
UNICEF	United Nations Children's Fund
UPS	Uninterruptible Power Supplies
WB	World Bank
WHO	World Health Organization

CHAPTER 1

CHAPTER 1 BACKGROUND OF THE PROJECT

1-1 Background of the Project

Compared to its Central Asian neighbors, Tajikistan still has a high maternal mortality rate (64 per 10,000 births), neonatal mortality rate (25 per 1,000 births), infant mortality rate (52 per 1,000 births) and under 5 mortality rate (63 per 1,000 births). These figures are due in part to the lack of a sufficient health care system and to the majority of medical facilities and equipment at obstetric and neonatal / infant care facilities being built and procured under the former Soviet Union; it is difficult to provide appropriate maternal and child health services because facilities and equipment are falling apart and because basic medical equipment is lacking.

The capital city of Dushanbe and Khatlon Province, the targets for this Project, have populations of 700,000 people and 2.7 million people, respectively. While Khatlon Province is the most populous of the three provinces in Tajikistan, 40% of its children are malnourished (compared to the national average of 10%) and its standard of living is low.

Given these circumstances, this Project seeks to help improve the level of diagnosis and treatment, hospital environments and maternal and child health services in target areas by improving medical equipment and establishing water supply and drainage facilities at the target sites for this Project: Maternity Hospital No. 3 in Dushanbe and Khatlon Oblast Provincial Hospital and two central district hospitals and five number hospitals in three districts (Jomi, Rumi and Shartuz) of Khatlon Province. In addition, Maternity Hospital No. 3 is one of the top referral hospitals in Dushanbe and also functions as a teaching hospital where training and such are administered for medical workers, so it makes a major contribution to clinical education in Khatlon Province and should be able to help raise the technical level of Khatlon Province medical workers.

Furthermore, a Japanese technical cooperation project for developing medical workers and improving maternal and child health in Khatlon Province is being implemented, and this Project contributes to synergy with the aforementioned technical cooperation project.

1-2 Condition of the Project Sites and Surrounding Area

1-2-1 Natural Conditions

(1) Meteorological Conditions

Mountainous areas make up 93% of the terrain of Tajikistan, and the land is full of undulations with elevations ranging between a few hundred meters to six or seven thousand meters above sea level. The Pamir Mountain Range in the eastern part of Tajikistan reaches all the way to the border with China, and the Fergana Valley in its northern reaches stretches to the borders with Uzbekistan and Kyrgyzstan.

A continental climate prevails over the Tajik capital of Dushanbe, in which Maternity Hospital No. 3 is located, and the southern Tajik province of Khatlon, in which Khatlon Oblast Provincial Hospital and central district hospitals and number hospitals selected for projects targeted by this Assistance Project are located. The climate on the plains is characterized by hot, dry weather with high temperatures over 35ºC from June through September and an average temperature below freezing from December through February with some areas receiving snowfall. Therefore, care was taken to include insulation measures in

these plans, particularly in plans for water supply and drainage facilities to protect against freezing inside pipes and frost damage to underground facilities.

Tajikistan is located near the boundary of the Eurasian and Indian Plates and experiences relatively large earthquakes. International Institute of Seismology and Earthquake Engineering records show the hypocenters of seven earthquakes of magnitude greater than 6.5 within Tajikistan since 1900, and the earthquake location map in Figure 1.1 shows that earthquakes occur mainly in the southern part of Tajikistan near its border with Afghanistan. Khatlon Province, one of the expected locations for these plans, shares a border with Afghanistan and is susceptible to the effects of earthquakes. Therefore, facility designs in these plans account for earthquakes.

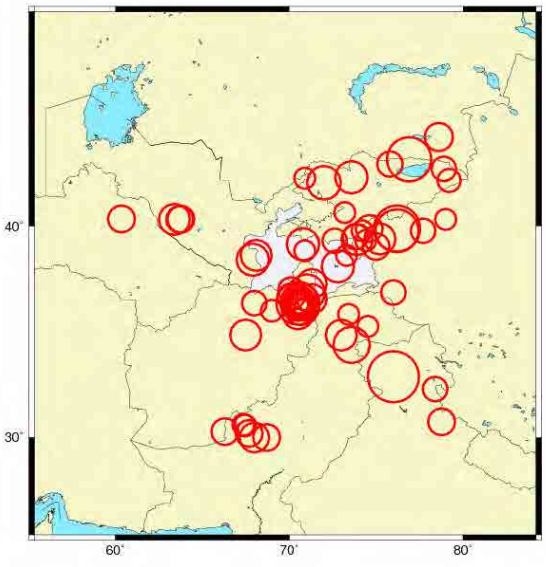


Figure 1.1 Earthquake Location Map

(2) Ground Surveys

1) Overview of Ground Surveys

Ground surveys have been conducted in plan locations. In these surveys, overall geological conditions of plan locations were verified and the physical and mechanical properties of soil samples taken from those sites was tested and analyzed.

Existing medical facilities are being operated in plan locations, so soil samples that had to be taken near medical facilities for which improvement is planned were taken from locations that did not affect the safety of those in the facilities or the operation of the facilities. Figures 1.2 and 1.3 show the locations from which soil samples were taken.

2) Soil Testing and Analysis Results

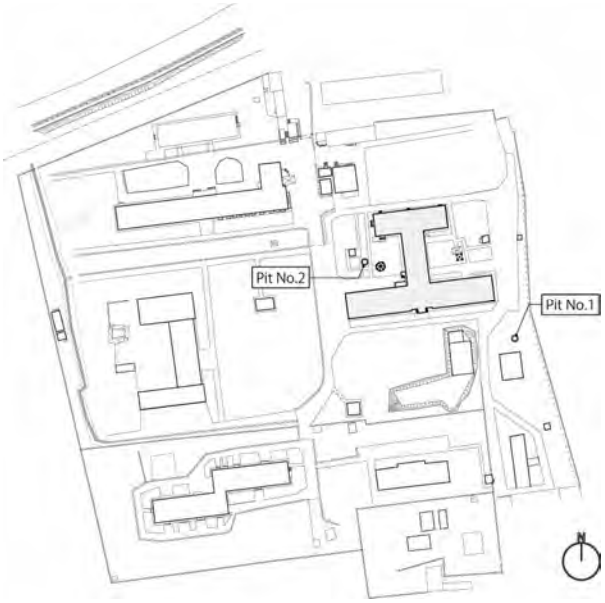
Table 1.1 shows the properties of soil samples taken from plan locations. Below are excerpts from the report on laboratory testing and analysis of those samples.

Shartuz Central District Hospital

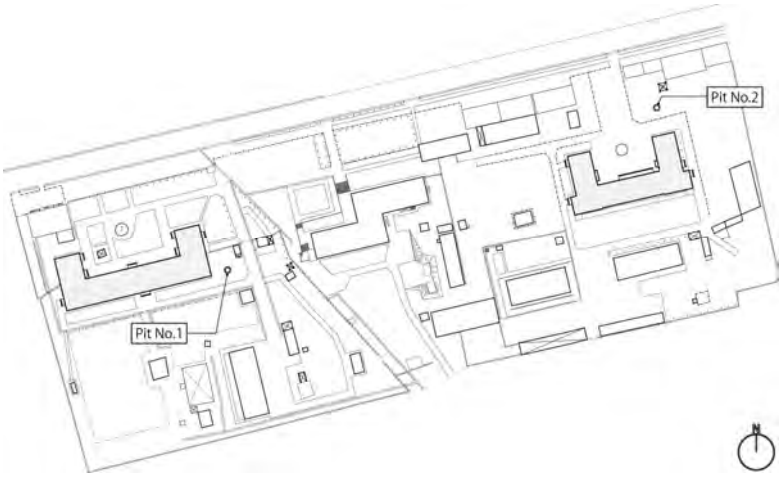
- Design soil bearing capacity: 180 kPa (1.8 kgf/cm^2)
- Groundwater levels range from 2.5 to 3.3 meters below the surface depending on seasonal fluctuations

Jomi Central District Hospital

- Design soil bearing capacity: 150 kPa (1.5 kgf/cm^2)
- Groundwater levels range from 2.0 to 3.0 meters below the surface depending on seasonal fluctuations



Figures 1.2 Location of Soil Sampling at Shartuz Central District Hospital



Figures 1.3 Location of Soil Sampling at Jomi Central District Hospital

Soil testing and analysis results show that the ground in all plan locations qualifies as soft ground, but this does not present an obstacle for construction because facility designs are structurally appropriate.

Table 1.1 Soil Properties

Plan Location	Excavation Depth	Density (t/m^3)	Water Content (Natural) (%)	Water Content (Dry) (%)	Water Content (Liquid Limit) (%)	Water Content (Plastic Limit) (%)	Porosity	Plasticity Index (%)	Soil Type/ Condition
Shartuz Central District Hospital	Sh-1 1.0 M	1.65	12.9	1.46	28.5	20.3	0.85	8.2	Hard loam
	Sh-2 2.0 M	1.80	22.6	1.47	28.9	20.1	0.84	8.8	Low-plasticity loam
	Sh-2 1.0 M	1.83	12.5	1.62	28.1	19.8	0.67	8.3	Hard loam
	Sh-2 2.0 M	1.97	22.2	1.61	28.6	19.6	0.68	9.0	Low-plasticity loam
Jomi Central District Hospital	Sh-1 0.8 м	1.80	22.1	1.47	27.8	19.3	0.84	8.5	Low-plasticity loam
	Sh-1 1.7м	1.86	25.9	1.48	27.9	19.6	0.82	8.3	Plastic loam near liquid limit
	Sh-2 1.0 м	1.83	23.6	1.48	28.1	19.5	0.87	8.6	Low-plasticity loam
	Sh-2 1.8 м	1.87	25.2	1.49	27.9	19.2	0.86	8.7	High-plasticity Loam

Source: Site Survey, August 2012

(3) Topographical Surveys

Figures 1.4 and 1.5 show the results of horizontal and vertical surveys conducted in plan locations. The land at each plan location has already been graded and contains existing medical facilities, and it was verified that there are no height differences that would interfere with the planned building layout.

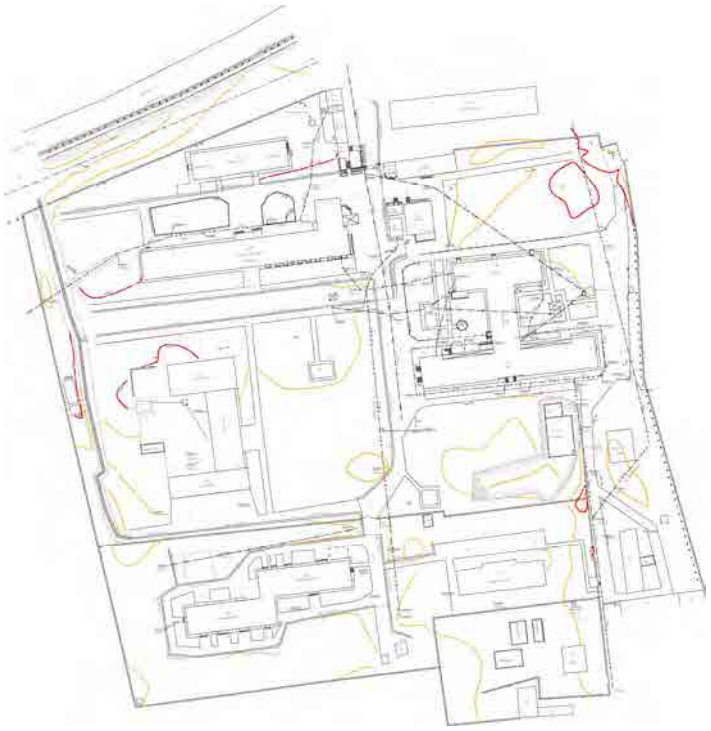


Figure 1.4 Survey Drawing of the Premises of Shartuz Central District Hospital

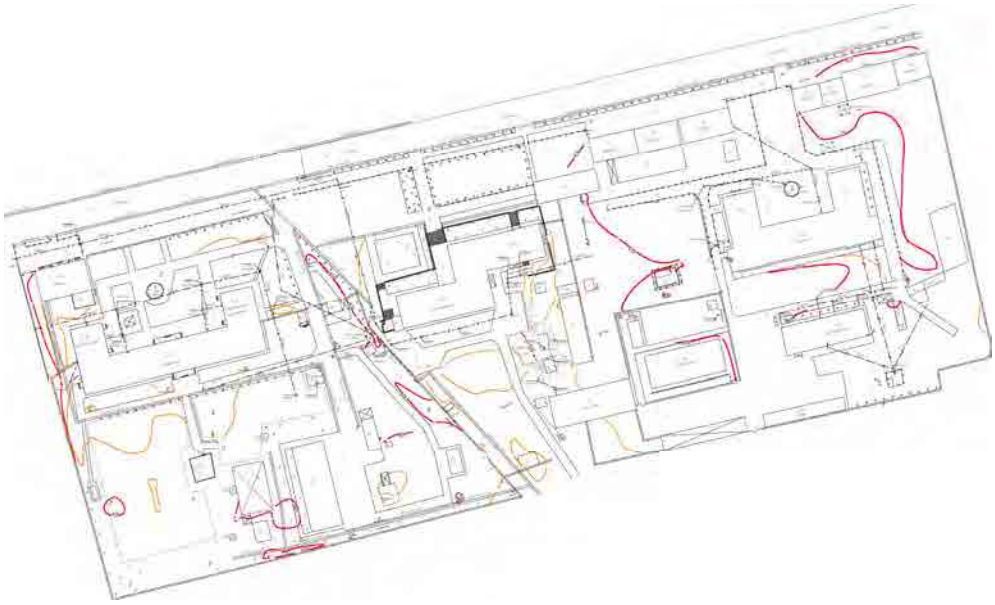


Figure 1.5 Survey Drawing of the Premises of Jomi Central District Hospital

1-2-2 Environmental and Social Consideration

Each site for the Assistance Project is already in operation as a medical institution, and thus the implementation of the Project does not require any residents nearby to move. The contents of the Assistance Project are chiefly provision of medical equipment and rehabilitate/establishment of water supply and drainage facilities. The former, there is no plan of medical equipment negatively impact the natural environment. The latter, on the other hand, chiefly concerns repair work for the water supply and drainage facilities of the existing medical institutions, which requires no large-scale land preparation work. Some sites require excavation work to lay new water supply pipes, but they are all conducted on the premises of the sites already leveled, and the areas to be excavated are minimized and thus the number of trees to be cleared is limited: the case does not fall under any substantial alteration to the natural environment.

As for miscellaneous drainage and waste water, the drainage pipes are connected to the public sewage system in the sites in Shartuz District which have been already equipped with such a public system, whereas, in the sites in Jomi District which have no public sewerage system, drainage and waste water is collected in septic tanks installed around the buildings to settle solid materials, and processed with infiltration inlets for spontaneous penetration. Therefore, it has no negative impact on the surrounding environment.

CHAPTER 2

CHAPTER 2 CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

(1) Overall Goal and Project Purpose

The government of Tajikistan has formulated the National Health Strategy (NHS) of the Republic of Tajikistan for the Period of 2011- 2020 under the assistance of international organizations, and is currently pursuing the strategies for enrichment and qualitative improvement of maternal and child health services. The policy is giving among other things, priority to the reinforcement of healthcare systems, improvement of hospitals serving as the bases for community healthcare services, and the improvement of core obstetric hospitals in the capital city Dushanbe and other major regional cities. On the other hand, due to the lingering financial difficulties, the country is not making sufficient progress in the provision and renewal of superannuating medical facility infrastructures, as well as the medical equipment needed for the delivery of basic medical services. The provision of medical facility infrastructures and the renewal of essential medical equipment are the issues that require immediate actions.

The Project is aiming to improve current capabilities in the service delivery for maternal and child health by improving the physical assets and utilities, such as medical equipment and water supply and drainage system of the secondary and tertiary hospitals in capital city Dushanbe and in provincial city of Khatlon Oblast, two of the most populated cities in the country.

(2) Outline of the Assistance Project

To achieve the above-mentioned goal, this Assistance Project is supporting to procure the medical equipment and rehabilitates the water supply and drainage system of the nine (9) target hospitals in Dushanbe and Khatlon Oblast Province.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

The original request from the Tajikistan side contained some ambiguities concerning the target sites and components (details of procurement of medical equipment, improvement of water supply and drainage systems, etc.), as well as the criteria for the selection of number hospitals for the Assistance Project. Due to these ambiguities, target sites were selected during the field survey based on the following site selection criteria.

(1) Sites for Procurement of Medical Equipment

Sites that;

- Provides medical services in obstetrics-gynecology and pediatrics,
- Staffed with obstetricians/gynecologists, pediatricians, and other medical workers providing these medical services,
- Capacity to provide and sustain technical and financial support for maintenance of the procured medical equipment,
- Capacity to provide water supply points/water sources within the premises,

- Can cope with power supply conditions and perform maintenance.

(2) Sites for Improvement of Water Supply and Drainage Systems

Sites that;

- have water supply connection point/water source within the premises
- is located where water quality of water sources satisfies the standards required by Tajikistan and/or WHO guidelines
- can ensure a stable supply of electric power for water supply and pumping (coverage of operating cost)
- planned for procurement of medical equipment (sites with plans for procurement of medical equipment under the Assistance Project or Technical Cooperation Project)

1) Sites that Have Own Water Supply Connection Point/Water Source in the Sites

The status of water supply to two (2) central district hospitals and fourteen (14) number hospitals under the survey are outlined in Table 2.1 water analyses have been conducted for 2 central district hospitals and 6 number hospitals which have water supply sources other than irrigation channels on the premises. The analyses were not conducted for the remaining 8 number hospitals which have no plan of supply of city water.

Table 2.1 State of Water Supply to the Subject Sites

Hospital	District	Name	State of water supply				
			City water	Well (depth)	Elevated tank (Height and capacity)	Water pressure (Mpa)	Water discharge (liter/min)
Central District Hospital	Shartuz		○	×	○ (10.4m, 8.8ton)	0.05	5～6
	Jomi		×	○ (110m)	○ (10m,10ton)	Unmeasurable	3
Number hospital	Jomi	No.1 Mehnat	×	×	—	—	—
		No.3 Kurbonov	×	×	—	—	—
		No.4 Bahor	×	×	—	—	—
	Rumi	No.1 Kalinin	×	×	—	—	—
		No.2 Giliston	×	×	—	—	—
		No.3 Toshrobat	×	×	—	—	—
		No.4 Navabot	×	○ (6m)	—	—	—
	Vakhsh	No.1 Kulob	×	×	—	—	—
		No.2 Vakhsh	×	×	—	—	—
		No3 Kirov	×	○ (8m)	—	—	—
		No.4 Hakikat	○	×	—	0.05	12
	Shartuz	No.1 Aivoj	×	○ (11m)	○ (4.1m,1.5ton)	Unmeasurable	Unmeasurable
		No.2 Iskra	×	○ (9m)	—	—	—
		No.3 Pakhtaobad[*1]	×	△ (43m)	—	—	—

Note) *1: Number Hospital No.3 in the Shartuz District has a faucet of well water in front of the entrance, which is supplied from an elevated tank in the region. Thus, the hospital was included in the scope of water examinations.

Source: Field Survey, August 2012

2) The Quality of Water Sources Satisfies the Standards required by Tajikistan or WHO Guidelines

＊ Water Quality Standards and Examinations

Table 2.2 shows the water quality standards of Tajikistan which the study team confirmed at the Republican Center for State Sanitary Epidemiological Surveillance of the Ministry of Health, together with the WHO Guidelines. The Survey Team decided to approve water sources on the water quality analyses if it satisfy, either the domestic standards or WHO Guidelines. The table also shows the decision criteria adopted in this Project. The Republican Center conducted the water quality analyses in detail, and the consultant conducted simplified examinations on site.

Table 2.2 Water Quality Standards in Tajikistan and WHO Guidelines

Item			Standards of Tajikistan	WHO Guidelines	Decision criteria of this Project
Bacterial Aspects	Coliform bacteria (per 100mL)		≦ 3 (tap water) ≦ 9 (well)	Not detected	≦ 3 (tap water) ≦ 9 (well)
	Common bacteria (per mL)		≦ 100	—	—
	Infectious bacteria		0	—	—
Physical Aspects	Odor		—	—	—
	Taste		—	—	—
	Color		—	15	—
	Turbidity		—	5	—
	TDS		—	1,000	—
Chemical Aspects	PH		6-9	—	—
	Ammonia	(mg/L)	≦2	1.5	≦2
	Nitrate (NO_2)	(mg/L)	≦3.0	3.0	≦3.0
	Nitrate nitrogen (NO_3)	(mg/L)	≦10-45	50	≦50
	Hardness	(mg/L)	≦7-10	—	—
	Chloride	(mg/L)	≦350	250	≦350
	Sulfide (SO_4)	(mg/L)	≦500	250	≦500
	Iron	(mg/L)	≦0.3-1.0	0.3	≦1.0
	Copper	(mg/L)	≦1.0	1.0	≦1.0
	Calcium	(mg/L)	≦200	—	—
	Magnesium	(mg/L)	≦125	—	—
	Manganese	(mg/L)	≦0.1-0.5	0.5	≦0.5
	DDT(agricultural chemical)	(mg/L)	0.002	0.001	0.002

＊ The Result of Examination

Table 2.3 shows the states of water supply at the sites, the results of the simplified water examinations at the site and water quality examinations made by the Republican Center for State Sanitary Epidemiological Surveillance, and the decision criteria.

- **Number hospitals**: According to the examinations of the Center, coliform bacteria that exceed the decision criteria have been detected in water sample from all the sites, so they are excluded from the coverage of the project.

- **Jomi Central District Hospital**: Sample water collected from the deep well has satisfied all the decision criteria, so the hospital is covered by the Project.

- **Shartuz Central District Hospital**: Coliform bacteria that substantially exceed the decision criteria have been detected in water sample from the water faucet of the obstetric and pediatric ward, which is supplied from the elevated tank. Water sample from the water faucet which constantly discharges water near the pump house has been found to satisfy the decision criteria. As for coliform bacteria found in water sample at the obstetric and pediatric ward, it is considered that minute fungus in water under high temperature has grown in the elevated tank, which has a large capacity and retains water for 3 days or so. Thus, it is considered that city water supplied to the ward itself has no problem, and thus the site is covered by the Project. Copper and manganese that exceed the acceptable values have been detected, but the Center has expressed its view that the water has no problem for drinking.

Table 2.3 Results of Water Quality Examination (Shared items fail to satisfy the decision criteria)

Hospital name				Central District Hospital			Number hospital					
				Shartuz		Jomi	Rumi	Vakhsh		Shartuz		
							No.4	No.3	No.4	No.1	No.2	No.3
Water Supply	Water source	Premises		○		○	○	○	○	○	○	△ Outside entrance
		Water source		City water		Deep well	Shallow well	Shallow well	City water	Shallow well	Shallow well	Deep well
		Depth of well (m)		—		110	6	8	—	11	9	43
Site where water is collected				Pediatrics	Pump house	Outdoor faucet	Well	Well	Outdoor faucet	Well	Well	Outdoor faucet
	Item		Decision criteria									
Simplified Examination	Color		—	Fairly light brown	—	Transparent	Light brown	Transparent	Transparent	Transparent	Transparent	Transparent
	Odor		—	Chlorine odor	—	None	None	None	None	None	None	None
	Temperature		—	30	—	18	21	20	27	19	22	25
	Turbidity		—	None	—	None	None	None	None	None	None	None
	Coliform bacteria		≦ 3 (tap water) ≦ 9 (well)	28	—	0	17	10	5	0	5	66
	Common bacteria		—	100 or more	—	0	100 or more	100 or more	12	4	100 or more	100 or more
	Chloride		≦350	20	—	10	50 or more	50	0	50 or more	50 or more	10
	Fluoride			0.6	—	0	0.6	0.8	0.3	0.6	0.8	0
	Iron		≦1.0	0.2 or less	—	0	0.7	0.2 or less	0.2 or less	0.2 or less	0.5	0.2 or less
	Nitrous acid			0.02 or less	—	0.02 or less	0.02 or less	0.02 or less	0.02 or less	0.02 or less	0.02	0.02 or less
	Nitrate acid		≦3.0	4	—	1 or less	10	10	1 or less	3	45	5
	Ammonia		≦2	0.2 or less	—	0.2 or less	1.5	0.2	0.2	0.2 or less	0.2 or less	0.2
Detail Examination	Bacterial Aspects	Coliform bacteria	≦ 3 (tap water) ≦ 9 (well)	1100	3	9 or less	2380	23	63	10	2380	2380
		Common bacteria	—	100 or more	30	5	100 or more	100 or more	100 or more	100 or more	100 or more	100 or more
		Infectious bacteria	—	None	None	None	None	None	None	None	None	None
	Physical Aspects	Odor	—	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Taste	—	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Color	—	3.90	3.20	1.48	4.40	1.50	2.00	3.90	3.60	4.60
		Turbidity	—	0.72	0.64	0.26	0.72	0.62	0.30	0.82	0.42	0.64
		TDS	—	0.00	0.58	0.00	1.04	0.00	0.00	1.10	0.64	1.00
		PH	—	9.20	6.90	8.81	8.80	9.30	8.90	7.80	7.50	8.80

		Ammonia	≦2	1.19	0.81	1.19	1.50	1.02	0.73	2.58	1.11	2.60
		Nitrate (NO_2)	≦3.0	0.09	0.09	0.10	0.13	0.07	0.06	0.12	0.10	0.12
		Nitrate nitrogen (NO_3)	≦50	41.5	25.1	14.0	27.4	26.0	38.0	34.0	23.4	69.4
		Hardness	—	9.0	10.0	19.0	11.2	17.0	6.0	12.8	16.0	8.4
		Chloride	≦350	56	43	312	199	269	213	92	64	78
		Sulfide (SO_4)	≦500	750	460	475	1000	625	325	775	325	350
		Iron	≦1.0	0.40	0.22	0.22	0.60	0.28	0.24	0.67	0.20	0.47
		Copper	≦1.0	1.55	1.20	0.33	2.10	4.18	0.42	3.64	0.41	4.20
		Calcium	—	240	192	320	180	220	98	160	160	120
		Magnesium	—	36.6	4.8	36.5	26.7	72.7	13.3	58.2	97.0	29.0
		Manganese	≦0.5	1.30	1.50	0.05	1.60	1.40	1.00	2.10	1.60	2.10
		DDT (agricultural chemicals)	0.002	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
Overall decision				×	○	○	×	×	×	×	×	×

3) Sites that Can Ensure a Stable Supply of Power for Water Supply and Pumping (coverage of operating cost)

As a result of the water quality examinations above, the two (2) central district hospitals in Jomi and Shartuz are covered by the plan for water supply and drainage system.

- **Shartuz Central District Hospital (1 Obstetric and Pediatric Ward)**
- **Jomi Central District hospitals (2 Wards in total; 1 Obstetric and 1 Pediatric)**

・ For water supply, Jomi Central District Hospital has deep wells on its premises, which will be used as water sources, so no operating cost incurs. Shartuz Central District Hospital is equipped with water pipelines of city water and has paid fixed-rate water charges for years and has no particular problem with the operation since no operating cost incurs.

・ Both Jomi and Shartuz Central District Hospitals have access to electricity on their premises and supply electricity to their existing institutions so that they can secure electricity power to operate water supply/storage pumps. In some seasons, however, electricity supply is interrupted due to accidental and planned outages, so a water supply/pumping system that can continue running without continuous electricity supply should be considered.

4) Sites Planned for Procurement of Medical Equipment (sites with plans for procurement of Medical Equipment under the Assistance Project or Technical Cooperation Project)

Both Jomi and Shartuz Central District Hospitals are covered by the “Project for Improving Maternal and Child Health Care System in Khatlon Oblast”, a technical cooperation project in progress since March 2012.

5) Water Supply and Drainage System covers Entire Building, including Obstetrics and Pediatrics

For both central district hospitals, new water supply systems are going to be established, so that pipe arrangements for water supply and drainage, and sanitary fittings need to be supplied to the entire buildings of the obstetric and pediatric departments.

- **Shartuz Central District Hospital:** The rooms water supply required at the obstetric and pediatric ward
- **Jomi Central District hospitals:** The rooms water supply required at the obstetric ward and the pediatric ward (Note that most of the first and second floors of the obstetric department at the obstetric ward are not in use at the moment: they are decrepit and will be refurbished. Pipe arrangements for water supply and drainage, and sanitary fittings are not supplied to these areas that are not yet refurbished.)

(3) Sites for Improvement of Water Supply and Drainage System

There is no backup emergency power supply for the pediatric ward of Khatlon Oblast Provincial Hospital. Therefore, to keep the ventilator and the other life support equipment during power outages, the Project plans the laying of an emergency power supply, including (outbuilding) generator room.

2-2-1-1 Basic Policy on Medical Equipment

(1) Policy on Scope and Grades of Medical Equipment

- The equipment plan aims to revitalize the medical practice in obstetric and neonatal/infant care services (perinatal care services including obstetrics/gynecology and neonate/infant care) and improve maternal and child health services. It should provide basic medical equipment needed by the relevant medical service departments.
- The plan mainly covers renewal of existing equipment. Any equipment that is replenished or newly procured should be an item that is indispensable for current medical workers and procedures.
- The plan should consist of equipment that can be operated and maintained by the Tajikistan side both in terms of technical skills and budget.
- The plan should consist of a range of equipment that can provide qualitative and quantitative support to the medical practice at the target medical facilities.

(2) Policy on Facility Infrastructure Conditions

The field survey found that public power supply has problem of severe voltage fluctuations and the condition of power supply is particularly poor during winter time (division hospitals generally receive power only for 4 to 5 hours a day). Therefore, to cope with voltage instability (high and low voltages), the addition of automatic voltage regulator (AVR), automatic voltage switcher (AVS), etc. should be considered as a measure to minimize the possibility of equipment failure. To ensure operation during power failure, the equipment used in areas such as ICUs should be equipped with uninterruptible power supplies (UPS). A number of hospitals should be provided with emergency power generators for use during scheduled blackouts and power interruptions.

(3) Guidelines for Use of Equipment Manuals in Russian

The field survey found that medical workers, including physicians, at medical facilities have difficulty in understanding manuals written in English. Although the medical equipment procured in this Assistance Project is customarily accompanied by manuals written in English, it is necessary to supplement them with

Russian translated versions of manuals. Manuals in Russian language should be provided for the types of medical equipment that usually come with manuals, excluding items such as operating instruments. Each manual need not be translated in its entirety. Only the parts concerning operation, maintenance, and troubleshooting should be translated.

(4) Policy Concerning the Use of Local Contractors and Materials from Neighboring Countries (Russia, Kazakhstan, Kyrgyzstan) and Local Sources

Although a majority of equipment can be procured from Japanese manufacturers, it is desirable to expand the range of eligible source countries in order to secure the presence of more than one agency with servicing capabilities and ensure competition principles in the bidding process. The equipment to be procured includes Anesthesia apparatus (with ventilator), Electrosurgical unit, Defibrillator, Patient monitor, Neonatal monitor, Ventilator (for Adult and for Infant), Ultrasound scanner, Pulse oxymeter, Cardiotocograph, Vacuum extractor, Oxygen concentrator, Nebulizer, Autoclave, Hot air sterilizer, Infusion pump, Syringe pump, Infant warmer, Infant incubator, etc. There are no manufacturers of medical equipment in Tajikistan, and eligible source countries are EU countries, the United States, and DAC member countries. In addition to the manufacturers with agencies in Tajikistan, those with agencies in neighboring countries such as Russia, Kazakhstan, and Kyrgyzstan may also be considered. In this way, the availability of agents for maintenance servicing should be warranted while competition principles are ensured.

(5) Policy on the Maintenance / Management Capability of Implementing Agency

The maintenance of medical equipment should be strengthened, aiming at a system in which equipment users practice of routine preventive servicing starting with cleaning before and after use is paramount. This is considered the best way to ensure the effective way to optimize the use of equipment. However, systematic ability for general maintenance of medical equipment, including response to failures, should be strengthened considering the following prescriptions.

1) Maintenance by Users

The standard management of medical equipment provided in this Assistance Project should be performed by each hospital according to the operation manuals, service manuals, etc. enclosed with the medical equipment.

2) Repair by Medical Equipment Agencies (Manufacturers' Agencies)

Ideally, on this Assistance Project, it should choose preferentially the types of equipment that could be maintained easily on a daily basis at each target hospital. However modern equipment, which is controlled by computerized mechanism, such equipment poses difficulty in troubleshooting and require repair by manufacturers' agents. Specifically, such equipment includes Patient monitor, Ultrasound scanner, Ventilator (Adult and Infant), etc.

In the Minutes of Discussions (M/D) related to this Preparatory Survey, the Ministry of Health and the

Preparatory Survey Team agreed that the cost of operation and maintenance for the planned equipment should be secured and allocated by the Tajikistan side properly following to the National Budget Plan.

3) Develop a System concerning the Medical Equipment Maintenance and Management at each Target Hospital

Inspection and servicing before and after use of the equipment is essential for maintaining their performance. Such routine servicing should be performed by the equipment users (clinical and medicl related staff members). Therefore, it is necessary to develop a system for obtaining support by the clinical and medical staffs in the maintenance and management, by introducing educational programs and trainings at each target hospital as a part of the staff training curriculum.

As one of the training opportunity, equipment users can be able to receive operational training by the Equipment Supplier. In addition to this, a Soft-component Program, as a part of the Assistance Project is supplemented by the consultant for establishing / strengthening the system properly.

(6) Policy Concerning the Implementation Schedule

The procurement of medical equipment is expected to require a period of approximately 8 months after the selection of Equipment Supplier(s).

(7) Policy Concerning the Treatment of Spare Parts and Expendable Items for the Procured Equipment

The plan should include expendable items in quantities covering the consumption during 6 months after the installation of equipment, considering the time needed for internal procedures at a target hospital and the time from placing an order to delivery, the budgetary arrangement needed for purchase, and other factors. Expendable items include recording papers and other items that are consumed regularly. These do not include spare parts that require disassembly, replacement, and assembly of equipment using tools.

2-2-1-2 Basic Policy on Rehabilitation of Water Supply and Drainage System

The target hospitals do not have enough water supply due to their decrepit or deteriorated water supply infrastructures and thus use water that their staff members manually draw from shallow wells on the premises of the facilities and store for drinking and hand-washing, though such water is contaminated. This Plan for water supply and drainage system aims to establish a water supply system using water sources whose quality have been confirmed to be safe, and thus to reduce the burden of medical workers, in particular, nurses, to “draw water”, which has interfered with their engagement in medical activities, and improve the quality of the medical services. Specifically, the Plan aims to improve the hygienic environment by improving the system for stable supply of clean water and the drainage system, both of which are essential for medical activities at the medical institutions currently covered by this Assistance Project.

(1) Design Policy on Rehabilitation of Water Supply and Drainage System

1) Policy on Water Supply

(i) There are two possible methods of supplying water to each room: One is the pump pressurized water supply system from a storage tank placed on the ground, and the other is the gravity water supply system via an elevated tank. Since the former uses electric power and may be stopped water supply to whole buildings by the reason of power outage and the timed power supply in the winter season. And this system, the pump operation by automatic control with sensing pressure inside the pipe is necessary. Therefore former system will be concerned by the influence of voltage fluctuation. For these reasons in order to build a more stable water supply system, the gravity water supply from the elevated tank is adopted.

(ii) To lift water to the elevated tank, hospital staff controls water supply by switching on/off the power of the pump and visually checking on overflow of the elevated tank. In consideration of effects of fluctuated electric voltage in winter, automatic pumping system with sensors using electrodes is not adopted.

(iii) The necessary amount of water supply is calculated by assuming the unit consumption volume (liter/piece/day) of each piece of equipment and multiplying it by the number of pieces. The assumption is based on the consumption volume of the existing sanitary fittings.

(iv) To avoid deterioration of the water quality inside the storage tank, the capacity of the tank is designed basically for the average consumption volume per hour, while taking into account the fluctuation of water supply in a short term.

(v) The height of the elevated tank is designed to secure the water pressure high enough to use of showers on the second floor.

(vi) The ability of storage pump is determined to be able to fill the tank in 20 minutes or so.

2) Policy on Drainage Plan

The existing drainage pipes are degraded over time and are likely to leak or cause problems, so open drainage pipes are newly laid. To minimize any impact on the existing facilities (main structure and finishing), the drainage pipes are laid outside the buildings right after the sanitary fittings, and the drainage slopes are secured outdoor.

3) Policy on Sanitary Fittings

The sanitary fittings are repaired carefully not to affect the main structure. Basically, the existing ones are removed and new ones installed at necessary places. For maintenance work in future, those which can be procured locally are selected.

4) Policy on Electricity System

Electric transmission is planned for the water supply system to be installed at the two central district hospitals. Electric power capacity to supply the electric load/demand is transmitted. For Khatlon Oblast Provincial Hospital, emergency electricity supply with generators is planned for the pediatric ward.

5) Coverage of the Assistance Project

The plan of the system for the cooperation project is outlined below. Thus, a small hut to restrict entry of third parties, emergency lighting and electric outlets to the hospital is supplied under the cooperation.

Table 2.4 Coverage of the Assistance Project

Hospital	Facility name	Repair/new construction	Quantity	Remarks
Shartuz Central District Hospital	Obstetric and pediatric ward: water supply system	Renovation	1 set	
	Obstetric and pediatric ward: drainage system	Renovation	1 set	Up to drainage crates surrounding the ward
	Elevated tank	New construction	1 tank	Tank capacity: 3 tons x 2 Height of tank: 15.5m
	Pump room	New construction	1 room	Water pumps: 2 pumps
Jomi Central District Hospital	Pediatric ward: water supply system	Renovation	1 set	
	Pediatric ward: drainage system	Renovation	1 set	Septic tank (new) inclusive
	Obstetric ward: water supply system	Renovation	1 set	
	Obstetric ward: drainage system	Renovation	1 set	Septic tank (new) inclusive
	Elevated tank	New construction	2 tanks	Tank capacity: 3 tons x 1 Height of tank: 15.5m
	Water rereiving tank and pump room	New construction	1 ward	Water receiving tank: 3 tons x 2 Well pump: 2 pumps Water pumps: 2 pumps
Khatlon Oblast Provincial Hospital	Pediatric ward: emergency lighting and electric outlets	New construction	1 set	
	Power generation room	New construction	1 room	

(2) Policy for Natural Environmental Conditions

The climate of Tajikistan is continental. It is dry in summer and rainfall increases from autumn to spring. In lowland, it is hot and dry between June and September, the high temperature exceeding 35 degree Celsius. From December to February, on the other hand, the average temperature is below zero and the snow accumulates. For reference, Figure 2.1 shows the temperature and rainfall in Kurgan-Tyube, the central city of the region concerned. Tajikistan is in the earthquake territory in the India-Eurasia Plate Collision Zone. To deal with these natural conditions, the plan of the system is put into practice in accordance with the following policies:

(i) Underground pipes are buried deeper than the freezing depth (GL-1.0m).
(ii) The water supply piping is heat insulated.
(iii) The Japanese earthquake-resistant design is applied to structural design.

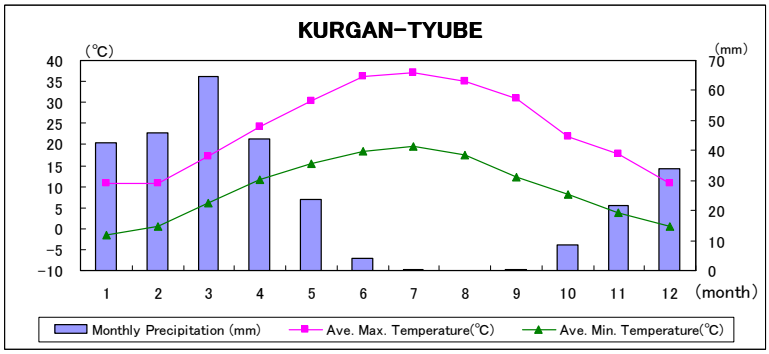


Figure 2.1 Monthly Precipitation, Monthly Average Max. and Min. Temperatures in Kurgan-Tyube

(3) Policy for Socio-Economic Conditions

In Tajikistan, electricity is supplied 24 hours a day in summer, but electricity generated is short in winter, so planned outages for many hours and electricity rationing are introduced. Shartuz Central District Hospital is provided with electricity for three (3) hours in the morning and four (4) hours in the afternoon in winter. Jomi Central District Hospital, on the other hand, enjoys preferential treatment of electricity supply and has no restriction on electricity supply hours, but electric outage occurs. The electric voltage is relatively stable in summer but fluctuates considerably in winter when electricity rationing is carried out and the balance of electricity consumption is lost among regions. Considering such circumstances, the Project is planned to supply water stably even if electricity supply is unstable.

(4) Policy for Situations affecting Construction and Procurement

As for construction materials, cement and aggregate can be procured in Tajikistan. The domestic cement, however, has some problems: the volume varies among packages, and the standards are not labeled on packages. Cement produced in and imported from Pakistan are widely available in Tajikistan and better in quality. Aggregates are collected at the river basin around sites of the plan of the Project, where some quarrying plants are in operation, and stable in quality.

There is no production facilities of steel products (steel shapes and reinforcing bars) in the country, so those widely available are imports chiefly from Russia, Iran and China. Steel products available at the market are sold in small lots and thus it is almost impossible to track them according to mill sheets. This plan is to use materials imported from Russia that can be identified based on mill sheets, or conduct strength tests for other materials at a construction experimental laboratory.

Materials and equipment for water supply and drainage system can be procured without any problem in Dushanbe, the capital of this country. Pipes are sold in small lots in Kurgan-Tyube and areas in the region concerned, but their markets are small and deal with small amount in volume. Thus, a certain volume of materials and equipment are procured in Dushanbe.

(5) Policy for Use of Local Representatives (Construction companies and consultants)

There are a large number of construction companies in Tajikistan, but so-called general contractors are mostly foreign capitalized. Domestic construction companies are small and undertake work by hiring craftsman and workers according to the size of orders received. They have sufficient technological capabilities, and test organizations for construction work test concrete, steels and other materials to be used. Even so, because the site of this plan is remote from Dushanbe, and also because this plan includes not only simple laying operation of water supply and drainage pipes but also construction of elevated tanks and others, it is necessary to secure the quality of a certain level as a grant aid project. Therefore, it is planned to use local construction companies, while the construction work is carried out under appropriate construction management of Japanese constructors.

(6) Policy for Operation, Maintenance and Management

1) Policy Concerning Maintenance of Medical Equipment

The plan should mainly consist of renewal and replenishment of existing equipment. Care should be so as not to cause technical and financial difficulties in maintenance.

2) Policy for Operation, Maintenance and Management of Hospital

At the hospitals subject to the plan, hospital staff workers operate the elevated tanks to supply water. The water supply and drainage system to be supplied under this plan is similar system to the current one to ensure the operation, maintenance and management.

(7) Policy for Setting of Grades of Facilities of Water Supply and Drainage

This plan uses materials and equipment that are locally available and repairable, it will adopt the grade of facilities that can be easily maintained after the implementation of this plan.

(8) Policy for Construction and Procurement Methods, and Schedule

1) Policy for Construction Method

For construction work, local contractors are used as subcontractors of Japanese trading companies or contractors. Construction materials and equipment are basically procured on site. For construction of the system, the local method is adopted for efficient work and appropriate schedule. To secure the quality satisfying Japan's technology standards, however, construction and supervisory systems are established.

2) Policy for Schedule

This plan covers 2 cooperation sites, but the construction work commences simultaneously to shorten the entire schedule. The construction work is roughly classifiable into pipe work and sanitary fitting work of the existing facilities (indoor), and construction work of elevated tanks and pump rooms that are independent of the existing facilities and work to bury pipes (outdoor). The outdoor work is carried out first, followed by the indoor work. Since the indoor work is carried out while keeping the hospitals in operation, the facilities are divided into small blocks comprising several rooms so as to proceed with the work for each block at a time.

2-2-2 Basic Plan (Equipment Plan / Plan of Water Supply and Drainage System)

2-2-2-1 Equipment Plan

(1) Overall Plan

The equipment planned for the Maternity Hospital No.3 in Dushanbe, Khatlon Oblast Provincial Hospital, and number hospitals consists of renewal of dilapidated existing equipment and the items that are essential in the provision of basic medical care services at relevant clinical departments. These items are planned for the purpose of supporting the improvement of medical services. Among the equipment listed in the plan, the items involving installation work are Operating Lights for the Maternity Hospital No.3 in Dushanbe, which are provided in the form of renewal of dilapidated existing equipment. While electricity and other incidental facilities are needed for the installation of these Lights, these are covered by the reuse of existing ones.

(2) Equipment Plan

The list of planned equipment originally assigned priority levels A or B to each item. The list shown below reflects the result of later revision based on analysis in Japan. Although the X-ray system for the Maternity Hospital No.3 in Dushanbe was first given A level priority, the provision of this item was considered difficult because the radiologists and radiographers who would use the X-ray system had been inactive for about last 10 years since broken down of the existing equipment.

1) The Maternity Hospital No.3 in Dushanbe

The provision of medical equipment covers all clinical departments of the hospital, including operating rooms, intensive care units, wards, and delivery rooms among others.

Table 2.5 List of Planned Equipment (Maternity Hospital No.3 in Dushanbe)

No.	Equipment	Quantity	Department/Room
Block A			
	Delivery department, Operating room (5th floor)		
A-1	Anesthesia Apparatus (with Ventilator)	1	Operating room
A-2	Operating Table	1	Operating room
A-3	Electrosurgical Unit	1	Operating room
A-4	Operating Light (Ceiling)	1	Operating room
A-5	Patient Monitor	1	Operating room
A-6	Pulse Oxymeter	1	Operating room
A-7	Suction Unit	1	Operating room
A-8	Instrument Trolley	1	Operating room
A-9	Cesarean Section Unit	3	Operating room
A-10	Stretcher	1	Operating room
A-11	Syringe Pump	2	Operating room
	Delivery room (5th floor)		

No.	Equipment	Quantity	Department/Room
A-12	Ultrasound Scanner (Portable)	1	Delivery room
A-13	Delivery Table	2	Delivery room
A-14	Bed for Delivery Use	8	Delivery room
A-15	Examination Light	5	Delivery room
A-16	Vacuum Extractor	2	Delivery room
A-17	Instrument Trolley	10	Delivery room
A-18	Emergency Kit (for Newborn)	3	Delivery room
A-19	Cardiotocograph	2	Delivery room
A-20	Infant Warmer	10	Delivery room
	Neonatal intensive care unit, NICU (4th floor)		
A-21	Syringe Pump	2	Neonatal intensive care unit
A-22	Infant Incubator	2	Neonatal intensive care unit
A-23	Neonatal Monitor	2	Neonatal intensive care unit
A-24	Ventilator (for Infant)	1	Neonatal intensive care unit
A-25	Suction Unit (Low Pressure)	2	Neonatal intensive care unit
A-26	Infant Warmer	2	Neonatal intensive care unit
A-27	Phototherapy Unit	2	Neonatal intensive care unit
A-28	Oxygen Concentrator	2	Neonatal intensive care unit
A-29	Cot (for Neonate)	5	Neonatal intensive care unit
	Ward, mothers with abnormal delivery (4th floor)		
A-30	Gynecological Examination Table	1	Consultation room
A-31	Examination Light	1	Consultation room
A-32	Infant Warmer	6	Ward
A-33	Stretcher	1	Ward
A-34	Patient Bed (for Adult)	20	Ward
A-35	Cot (for Neonate)	20	Ward
A-36	Bedside Cabinet	20	Ward
	Ward, normal delivery (3rd floor)		
A-37	Stretcher	1	Ward
A-38	Wheel Chair	1	Ward
A-39	Gynecological Examination Table	1	Consultation room
A-40	Examination Light	1	Consultation room
A-41	Infant Warmer	5	Ward
A-42	Baby Scale	2	Ward
A-43	Patient Bed (for Adult)	20	Ward
A-44	Cot (for Neonate)	20	Ward
A-45	Bedside Cabinet	20	Ward

No.	Equipment	Quantity	Department/Room
	Ward, normal delivery (2nd floor)		
A-46	Stretcher	1	Ward
A-47	Wheel Chair	1	Ward
A-48	Gynecological Examination Table	1	Consultation room
A-49	Examination Light	1	Consultation room
A-50	Infant Warmer	5	Ward
A-51	Baby Scale	2	Ward
A-52	Bed (for Adult)	20	Ward
A-53	Cot (for Neonate)	20	Ward
A-54	Bedside cabinet	20	Ward
	Delivery and mothers with infection (1st floor)		
A-55	Bed for Delivery use	4	Delivery room
A-56	Delivery Table	1	Delivery room
A-57	Infant Warmer	4	Delivery room
A-58	Instrument Trolley	4	Delivery room
A-59	Examination Light	2	Delivery room
A-60	Suction Unit	1	Delivery room
A-61	Vacuum Extractor	2	Delivery room
A-62	Stretcher	1	Delivery room
	Ward for infection delivery (1st floor)		
A-63	Gynecological Examination Table	1	Consultation room
A-64	Patient Bed (for Adult)	20	Ward
A-65	Cot (for Neonate)	20	Ward
A-66	Bedside Cabinet	20	Ward
A-67	Infant Warmer	10	Ward
A-68	Emergency kit (for Newborn)	2	Ward
A-69	Cardiotocograph	1	Ward
A-70	Baby Scale	2	Ward
Block B			
	Operating Department, intensive care unit (5th floor)		
B-1	Anesthesia Apparatus (with Ventilator)	2	Operating room
B-2	Patient Monitor	8	Operating room
B-3	Pulse Oxymeter	2	Operating room
B-4	Operating Table	2	Operating room
B-5	Operating Light (Ceiling)	2	Operating room
B-6	Electrosurgical Unit	2	Operating room
B-7	Suction Unit	2	Operating room

No.	Equipment	Quantity	Department/Room
B-8	Instrument Trolley	3	Operating room
B-9	Cesarean Section Unit	3	Operating room
B-10	Gynecological Operating Instrument Set	3	Operating room
B-11	Oxygen Concentrator	5	Operating room, ICU
B-12	Emergency Kit (for Newborn)	1	Operating room
B-13	Hot Mattress for Operation	2	Operating room
B-14	Autoclave	1	Operating room
B-15	Stretcher	1	Operating room
B-16	Ventilator (for Adult)	2	ICU
B-17	Infusion Pump	2	ICU
B-18	IV Pole Stand	13	Recovery room, ICU
B-19	Defibrillator	1	ICU
B-20	Infant Incubator	1	ICU
B-21	Gynecological Examination Table	2	Consultation room
B-22	Curettage of Uterus Cavity Instrument Set	3	Consultation room
B-23	Ultrasound Scanner (Portable)	1	Ward
B-24	Baby Scale	1	Ward
B-25	Refrigerator (Blood Bank)	1	Ward
B-26	Patient Bed (for Adult)	13	ICU, recovery room, ward
B-27	Cot (for Neonate)	5	Ward
B-28	Bedside Cabinet	13	Ward
	Ward (mothers with abnormal delivery) (4th floor)		
B-29	Gynecological Examination Table	1	Consultation room
B-30	Examination Light	1	Consultation room
B-31	Ultrasound Scanner (Portable)	1	Consultation room
B-32	Refrigerator (Medicine)	1	Treatment room
B-33	IV Pole Stand	11	Consultation room, ward
B-34	Stretcher	1	Ward
B-35	Wheel Chair	1	Ward
B-36	Patient Bed (for adult)	40	Ward
B-37	Bedside Cabinet	40	Ward
	Ward (miscarriage, premature delivery) (3rd floor)		
B-38	Gynecological Examination Table	1	Consultation room
B-39	Examination Light	1	Consultation room
B-40	Ultrasound Scanner (Portable)	1	Consultation room
B-41	Refrigerator (Medicine)	1	Treatment room
B-42	IV Pole Stand	10	Treatment room, ward

No.	Equipment	Quantity	Department/Room
B-43	Stretcher	1	Ward
B-44	Wheelchair	1	Ward
B-45	Patient Bed (for Adult)	35	Ward
B-46	Bedside Cabinet	35	Ward
	Department of Gynecology (2nd floor)		
B-47	Gynecological Examination Table	1	Consultation room
B-48	Examination Light	1	Consultation room
B-49	Ultrasound Scanner	1	Consultation room
B-50	Refrigerator (Medicine)	1	Treatment room
B-51	IV Pole Stand	7	Treatment room, recovery room, ward
B-52	Stretcher	1	Ward
B-53	Wheel Chair	1	Ward
B-54	Patient Bed (for Adult)	18	Ward, recovery room
B-55	Bedside Cabinet	18	Ward, recovery room
Block C			
	Laboratory Test Department (5th floor)		
C-1	Spectrophotometer	1	Biochemistry laboratory
C-2	pH Meter	1	Biochemistry laboratory
C-3	Centrifuge (General purpose)	1	Biochemistry laboratory
C-4	Hematocrit Centrifuge	1	Biochemistry laboratory
C-5	Refrigerator (Medicine)	1	Biochemistry laboratory
C-6	Binocular Microscope	2	General laboratory
C-7	Autoclave	2	Biochemistry laboratory, etc.
	Gynecology Outpatient Clinic (2nd floor)		
C-8	Gynecological Examination Table	2	Examination room (gynecology)
C-9	Examination Light	2	Exam room (gyn, cervical cancer)
C-10	Ultrasound Scanner	1	Examination room
C-11	Colposcope	1	Examination room
C-12	Stretcher	1	Consultation room
C-13	Wheel Chair	1	Examination room
C-14	Weighing Scale (for Adult)	1	Examination room

2) Khatlon Oblast Provincial Hospital

The provision of equipment covers the 4-story pediatrics building.

Table 2.6 List of Planned Equipment (Khatlon Oblast Provincial Hospital)

No.	Equipment	Quantity	Location	
			Pediatric Internal Medicine	Pediatric Surgery
H-1	Infant Warmer	3	2	1
H-2	Infant Incubator	2	2	-
H-3	Phototherapy Unit	2	2	-
H-4	Pulse Oxymeter	5	3	2
H-5	Oxygen Concentrator	3	2	1
H-6	Infusion Pump	5	3	2
H-7	Instrument Trolley	8	8	-
H-8	Neonatal Monitor	3	2	1
H-9	Suction Unit (Table top)	5	3	2
H-10	Ventilator (for Infant)	3	2	1
H-11	Nebulizer	3	2	1
H-12	Bilirubin Meter	3	2	1
H-13	Ultrasound Scanner	2	1	1
H-14	Patient Bed (for Adult)	40	40	-
H-15	Patient Bed (for Child)	20	20	-
H-16	Cot (for Neonate)	20	20	-
H-17	IV Pole Stand	15	10	5
H-18	Baby Scale	3	2	1
H-19	Hot air Sterilizer	3	3	-
H-20	Emergency Kit (for Newborn)	3	2	1
H-21	Emergency kit (for Pediatric)	2	2	-
H-22	Generator (B)	1	1	-

3) Five Number Hospitals

The provision of equipment covers five (5) number hospitals. These are Jomi District No. 1 and No. 3 Number Hospitals, Rumi District No. 1 and No. 2 Number Hospitals, and Shartuz District No. 3 Number Hospital. The plan covers basic equipment for outpatient care and equipment for wards.

Table 2.7 List of Planned Equipment (Number Hospitals)

No.	Equipment	Quantity					
		J 1	J 3	R 1	R 2	S 3	Total
D-1	Gynecological Examination Table	1	1	1	1	1	5
D-2	Bed for Delivery Use	1	1	1	1	1	5
D-3	Clinical Thermometer	2	5	5	5	5	22
D-4	Stethoscope (Double Head)	3	4	4	6	4	21
D-5	Sphygmomanometer (Aneroid type)	1	1	1	1	1	5
D-6	Examination Light	1	1	1	1	1	5
D-7	Weighting Scale (for Adult)	1	1	1	1	1	5
D-8	Height Scale (for Infant)	1	1	1	1	1	5
D-9	Height Scale (for Infant)	1	1	1	1	1	5
D-10	Height Scale (for Pediatric to Adult)	1	1	1	1	1	5
D-11	Patient Bed (for Adult)	3	5	7	7	7	29
D-12	Cot (for Neonate)	2	3	5	5	3	18
D-13	Room Temperature Meter	2	1	2	2	1	8
D-14	IV Pole Stand	2	3	3	3	3	14
D-15	Instrument Trolley	1	1	1	1	1	5
D-16	Fetal Doppler	1	1	1	1	1	5
D-17	Delivery Instrument Set	2	2	3	3	2	12
D-18	Hot Air Sterilizer	1	1	1	1	1	5
D-19	Emergency Kit (for Newborn)	1	1	1	1	1	5
D-20	Emergency Kit (for Pediatric)	1	1	1	1	1	5
D-21	Generator (A)	1	1	1	1	1	5

Note: Abbreviations of the names of number hospitals:

J1: Jomi No. 1, J3: Jomi No. 3, R1: Rumi No. 1, R2: Rumi No. 2, S3: Shartuz No. 3.

4) Technical Specifications of the Major Equipment

Technical Specifications of the major equipment to be planned in this Project are shown in Table 2.8.

Table 2.8 Technical Specifications of the Major Equipment

No.	Equipment	Key Specifications / Construction		Purpose of use / rationale for grading
1	Ultrasound Scanner	Scanning method : Monitor rack: Monitor: Modes:	Convex, linear, transvaginal Provided, with casters 10.5” or more B, M, B/M	Used for examinations in obstetrics and gynecology, including the examination of fetal status in mothers undergoing delivery. General-purpose model.
2	Ultrasound Scanner (Portable)	Scanning method: Monitor: Modes:	Convex, linear 9” or more B, M, B/M	Used for examinations in obstetrics and gynecology, including the examination of fetal status in mothers undergoing delivery. General-purpose model.
3	Patient Monitor	Measured parameters: Display: Number of waveforms: Other:	ECG, respiration, SpO2, body temperature, NIBP, etc. Color LCD, 10.4” or more 5 waveforms or more Provided with a rack	A system for continuous observation of vital information on a patient undergoing surgery or in ICU. General-purpose model.
4	Anesthesia Apparatus (with Ventilator)	O2, N2O: Ventilator: Ventilation method: Tidal volume:	0.2-10 L/M, 0.2-10 L/M, or more Integrated or built in to anesthesia cart Electric powered Volume-controlled / time cycle About 20-1,400 ml or more	Used for general anesthesia with vaporized anesthetic agents during surgery. General-purpose model.
5	Ventilator (for Infant)	Method: Transition type: Operation modes: PEEP/CPAP: Spontaneous respiration method:	Pressure-controlled / volume-controlled Breathing pressure restriction + time cycle CV / IMV / CPAP 0-20 cmH_2O or more Constant Flow	Used for respiration management of an infant patient with respiratory failure or after surgery. Capable of pressure-controlled ventilation in children weighing less than 5 kg. General-purpose model.
6	Ventilator (for Adult)	Method: Operation modes: PEEP/CPAP	Volume-controlled / pressure-controlled SIMV, IMV, ASSIST, PEEP, CPAP 0-20 cmH_2O or more	Used for respiration management of a patient with respiratory failure or after surgery. Capable of volume-controlled / pressure-controlled ventilation in adults and children (< 10 kg). General-purpose model.

No.	Equipment	Key Specifications / Construction		Purpose of use / rationale for grading
7	Operating Light (Ceiling)	Type: Illumination:	Ceiling pendant Illumination: 160,000 lux or more	Lighting during surgery. General-purpose model.
8	Cardiotocograph	Heart rate display: HR counting mode: HR input mode: Sensitivity of contraction recording and display: Fetal movement marking (NST)	About 50-210 beats/min. or more Autocorrelation function method Ultrasonic Doppler method About 20 mm/100 g Printed	Used for assessment of fetal well-being and evaluation of fetus in the latter half of gestation based on the measurement of fetal heart rate and uterine contraction. Must be able to simultaneously measure fetal HR and uterine contraction to support diagnosis of threatened premature delivery, fetal distress, weak pains / excessively strong pains, etc. General-purpose model.
9	Fetal Doppler, Manual	Mid-range acoustic frequency: Ultrasound output: Audible output: Built-in battery:	2.5 MHz 10 mW / cm2 or less 0.6 W or more Full charge battery life 3 hours or more	A system that detects heart sound and heart rate of a fetus for confirmation of presence/absence of abnormality. General-purpose model.
10	Patient Monitor	Measured parameters: Display: Number of waveforms: Other:	ECG, respiration, SpO2, body temperature, NIBP, etc. Color LCD, 8.4” or more 5 waveforms or more Provided with a rack, accessories support the use for adult.	A system for continuous observation of vital information in ICU (adult). General-purpose model.
11	Neonatal Monitor	Measured parameters: Display: Number of waveforms: Other:	ECG, respiration, SpO2, body temperature, NIBP, etc. Color LCD, 8.4” or more 5 waveforms or more Provided with a rack, accessories support the use for neonates.	A system for continuous observation of vital information in ICU (neonatal). General-purpose model.
12	Electrosurgical Unit	Maximum output: Modes: Memory function: Maximum frequency:	300 W or more Incision, coagulation, bipolar, etc. Built-in 0.5 MHz - 1 MHz	Electric powered knife used in open surgery (incision). General-purpose model.
13	Infusion Pump	Infusion flow rate: Flow rate accuracy: Battery:	Capable of setting at 1 ml/h ±10% or less 2 hours or more	Used for infusion in very small quantities. General-purpose model.

No.	Equipment	Key Specifications / Construction		Purpose of use / rationale for grading
14	Syringe Pump	Syringe size: Flow rate setting: Flow adjustment steps: Flow rate accuracy: Battery:	10, 20, 30, 50 ml or more 0.1-1,200 mL/h or more Capable of setting at 0.1 ml and 1.0 ml ±3% or less Built-in	Used for infusion in very small quantities. General-purpose model.
15	Infant Incubator	Range of internal temperature setting: Access ports: Range of oxygen adjustment: Range of humidity adjustment: Alarm function:	34 - 37.5℃ or more Front and back ends: 2 each, side: 1 or more Min range 21-75% 50-90% or more Provided	Used for temperature support and oxygen therapy to neonates. General-purpose model.
16	Bilirubin Meter	Measurement range: Measurement accuracy: Rechargeability: Lifespan of light source:	0-20 mg/dL or more ±1.5mg/dL Provided About 30,000 measurements	A simple instrument for percutaneous measurement of bilirubin level. General-purpose model.
17	Infant Warmer	Skin temperature adjustment: Oxygen flowmeter: Bed inclination: Alarm function:	Automatic and manual Included ±5° Provided	Used for temperature support and oxygen therapy to neonates. General-purpose model.
18	Defibrillator	Energy setting: Display screen: Range of heart rate measurement: Battery:	5-200 J or more 4.7” or more 40-180 bpm or more Built-in	Used for removing ventricular fibrillation. General-purpose model.
19	Vacuum Extractor	Maximum suction force: Suction bottle: Accessories:	700 mmHg or more 2 Lit or more in total Foot switch, suction cups (sizes S, M, L)	An apparatus that support child delivery using suction force. General-purpose model.

No.	Equipment	Key Specifications / Construction		Purpose of use / rationale for grading
20	Spectrophotometer	Wavelength range: Spectrum band: Light source: Optical system: Display screen:	200-1100 or more 5 nm Halogen or xenon Single beam LED or LCD	A solution containing a test substance, with or without color development by the addition of reagents, is placed in a light beam and the light absorbance of the solution is measured for the purpose of qualitative or quantitative analysis of the substance in the solution or the determination of the structure of the sample substance.
21	Bed for Delivery Use	Type: Back board: Knee flexion: Accessories:	2-crank 0-75°or more About 0-45° Side rail, hanger rod, canister	Because sickroom beds are used for delivery in Tajikistan, the beds for delivery are planned to be the beds that are used in general wards.
22	Operating Table	Control: Accessories: Back/forward tilt angle: Left/right tilt angle: Leg board angle: back board fold angle:	Manual hydraulic lift Curtain stand (1), shoulder rest (1 pair), side rest (1 pair), arm support (2), foot rest (1 pair), leg holder (1 pair), etc 15°/20°or more 25°/25°or more Min. 90° down, 60° right or left Min. 60° up, 20° down	A system used for surgical operation. General-purpose model.

2-2-2-2 Plan for the Water Supply and Drainage System

This cooperation project is to supply and drain water to the existing facilities from the existing water sources. The conditions of infrastructure improvement of the two central district hospitals are listed in Table 2.9 as follows:

Table 2.9 Current Infrastructure

Shartuz Central District Hospital	Water source	City water (necessary to pump up to the elevated tank)
	Coverage of the existing water supply and drainage system	The pediatric department of the obstetric and pediatric ward (water supplied from the existing elevated tank)
	Coverage of planned water supply and drainage system	The entire area of obstetric and pediatric ward including the departments of obstetrics and pediatrics
	Drainage	Connected to the public sewage
Jomi Central District Hospital	Water source	Deep well (Flowing well but it is necessary to pump up to the elevated tank)
	Coverage of the existing water supply and drainage system	Pediatric ward: operation room (water supplied from the existing elevated tank)
	Coverage of planned water supply and drainage system	The entire area of the obstetric and pediatric ward including the departments of obstetrics and pediatrics
	Drainage	No connection to the public sewage

(1) Water Supply System

1) Basic Plan

The water supply system for the each hospital is planned as followins.

(i) Shartuz Central District Hospital:

It currently pumps up city water to the elevated tank and supplies it to the premises with the gravity supply system. However, the current tank is decrepit and leaks, so it is difficult to maintain it. In addition, the capacity is so large that the water stored is likely to deteriorate in quality (dead water and proliferation of coliform bacteria). Thus, the Plan is to build a new storage pump and elevated tank as new water supply system. A back-up tank will be built for the elevated tank in consideration of electric rationing in winter. In addition, the existing water supply facilities such as the elevated tank, pump room etc., will be retained.

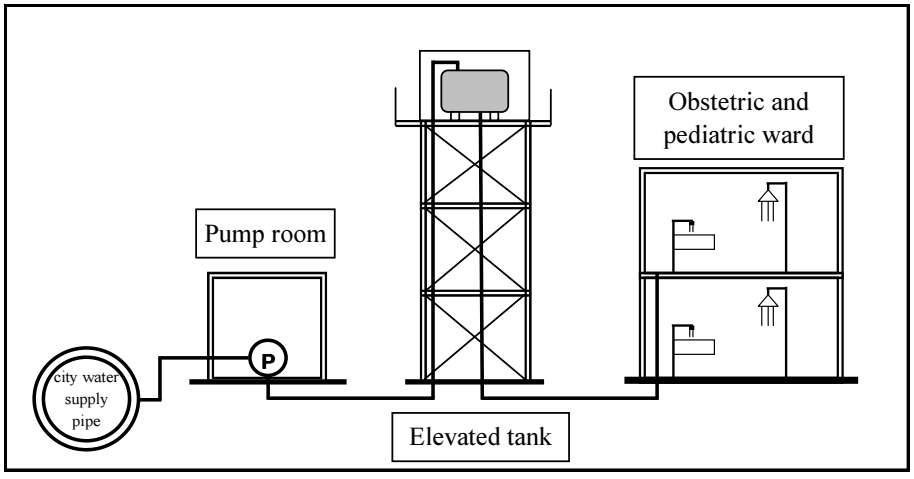


Figure 2.2 Schematic Diagram of Water Supply System: Shartuz Central District Hospital

(ii) Jomi Central District Hospital:

It currently pumps up water from a deep well (flowing well) of 110m in depth to the elevated tank and supplies water to the operation room at the pediatric ward with the gravity supply system. The present elevated tank is decrepit and is not well designed for maintenance work, while it is necessary to avoid discontinuation of water supply during the construction work. Thus, a new water supply system is built. Specifically, a new well pump is installed near the well to lead water through the existing pipes, which a primary receiving tank is installed to adjust the amount of water to take in and control back-pressure to the existing water supply system. The obstetric and pediatric wards, for which the water supply system is to be built, are some 240m away from each other, and some medical facilities exist between them. Hence, two primary water receiving tanks are installed to transmit water by storage pumps to the elevated tanks near the individual wards. In addition, the existing water supply facilities such as elevated tank, pump room etc., will be retained.

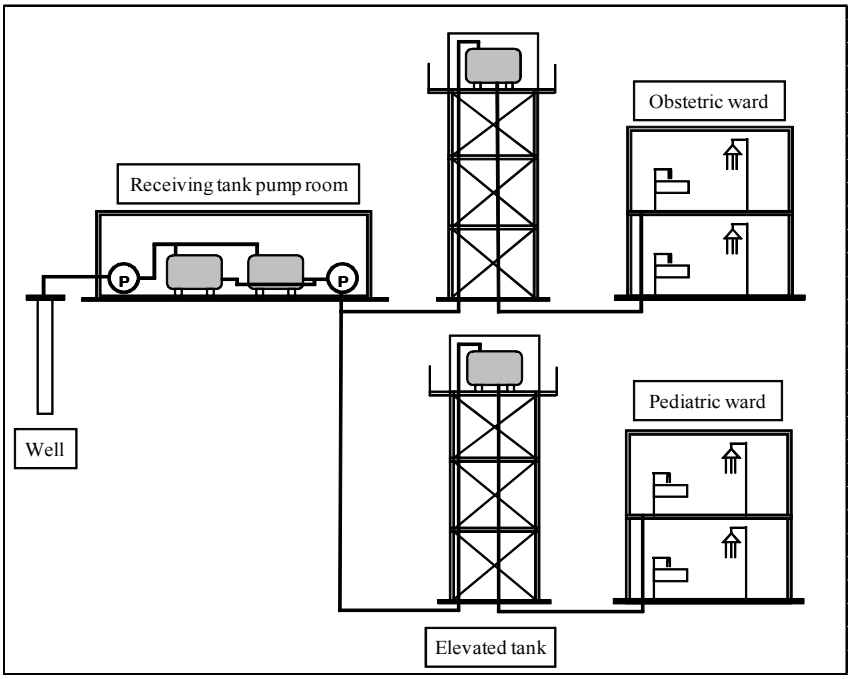


Figure 2.3 Schematic Diagram of Water Supply System: Jomi Central District Hospital

2) Calculation of the Capacity of Water Tank

The unit consumption volume (L0) of the existing water supply system is calculated by dividing the capacity of the existing elevated tank (V0) by the number of days of use (D) and the number of the existing fittings (N).

» **Unit consumption volume: L_0 (m^3/day/piece) = V_0 / (D x N)**

Estimated hourly average supply volume (Lh) is calculated by multiplying the current consumption volume (L0) by the number of new fittings (Nn) and divided by the number of hours of use per day (T: assumed to be 8 hours/day).

» **Estimated hourly average supply volume: L_h (m^3/hour) = (Nn x L_0) / T**

Table 2.10 Calculation of the Capacity of Water Tank

Facilities		Consumption volume of the existing water supply system				Estimated hourly average supply volume	
		V_0 (m^3)	D (day)	N (piece)	L_0 (m^3/day/piece)	Nn (piece)	L_h (m^3/hour)
Shartuz Central District Hospital	Obstetric and pediatric ward	8.8	3.0	26	0.113	100	1.413
Jomi Central District Hospital	Obstetric ward	10.0	10.0	10	0.100	70	0.875
	Pediatric ward					60	0.750

(i) Shartuz Central District Hospital:

The nominal capacity of the tank is made at twice as large as the estimated hourly average supply volume (2.826m^3) to take into account short-term fluctuations of water supply. The tank is designed to have 3.0m^3 to secure spout. In addition, another tank of the same capacity (3.0m^3) is provided to deal with electricity rationing.

(ii) Jomi Central District Hospital:

The nominal capacity of the tank for the obstetric ward is made at twice as large as the estimated hourly average supply (1.75m^3) as stated above. To secure spout and deal with outage of long hours, the tank is designed to have 3.0m^3. The tank for the pediatric ward is also designed to have 3.0m^3.

3) Height of Elevated Tank

The necessary height of the elevated tank (H) is calculated according to the following formula, using the height difference between the representative water supply fittings and the ground where the elevated tank is to be installed (H0), the necessary minimum water pressure of the representative water supply fittings (P1), the actual length of pipes from the tank to the fittings (L1), the equivalent length of local resistance (L2), the frictional resistance of pipes (R) and the safety factor (F).

$$H \geqq H0 + (P1 + (L1+L2) \times R \times F) / 9.81$$

Table 2.11 Calculation of the Height of Elevated Tank

Facilities		H_0 (m)	P_1*2 (kPa)	L_1 (m)	L_2*1 (m)	R (kPa/m)	F	Necessary height (H) → Planned height
Shartuz Central District Hospital		6.700	70	130	130	0.014*3	1.2	14.39 m → 15.5 m
Jomi Central District Hospital	Obstetric ward	6.700	70	130	130	0.014*4	1.2	14.39 m → 15.5 m
	Pediatric ward	6.700	70	130	130	0.011*5	1.2	14.27 m → 15.5 m

Notes: *1: $L_2 = L_1$

*2: Water pressure necessary for use of shower

*3: The value of frictional resistance of pipes when the estimated hourly average supply volume L_h=1.413 with the main pipe 50A.

*4: The value of frictional resistance of pipes when the estimated hourly average supply volume L_h=0.875 with the main pipe 40A.

*5: The value of frictional resistance of pipes when the estimated hourly average supply volume L_h=0.750 with the main pipe 40A.

4) Calculation of the ability of storage pump

The water delivery ability and lifting height of the well pump of Jomi Central District Hospital and the storage pumps for the elevated tanks of the two hospitals are calculated as follows:

(i) Water conveyance capacity

The water conveyance capacity of the well pump of Jomi Central District Hospital is designed to fill the two receiving tanks in 60 minutes or so.

Water conveyance capacity = $2\times3.0\times10^3$ (L) / 60 (min) = 100 (L/min)

The water conveyance capacity of the storage pumps for the elevated tanks of the two hospitals is designed to fill the receiving tanks in 20 minutes or so.

Water conveyance capacity = 3.0×10^3 (L) / 20 (min) = 150 (L/min)

(ii) Calculation of the lifting height

The lifting height of the pumps is calculated according to the following formula, using the total length of pipe (L0), local resistance (L1), the frictional loss resistance (R) and the actual height (H0).

H =H0 + ((L0+L1)×R / 9.81)

Table 2.12 Calculation of the Pump Ability

Facilities		H_0 (m)	L_0 (m)	L_1 (m)	R (kPa/m)	H (m)	Diameter (mm)	Specifications of pump
Shartuz Central District Hospital		20.0	20	20	0.70	22.9	50	50A×150L/min×23m
Jomi Central District Hospital	Well pump	10.0	20	20	0.70	12.9	50	50A×100L/min×13m
	Obstetric ward Pediatric ward	20.0	300	300	0.70	62.8	50	50A×150L/min×63m

(2) Drainage system

1) Basic Plan

The drainage system for the each hospital is planned as follows.

(i) Shartuz Central District Hospital:

It can be connected to the public drainage system, and there are drainage crates in use around the obstetric and pediatrics ward. The drainage system from each room is connected to these drainage crates.

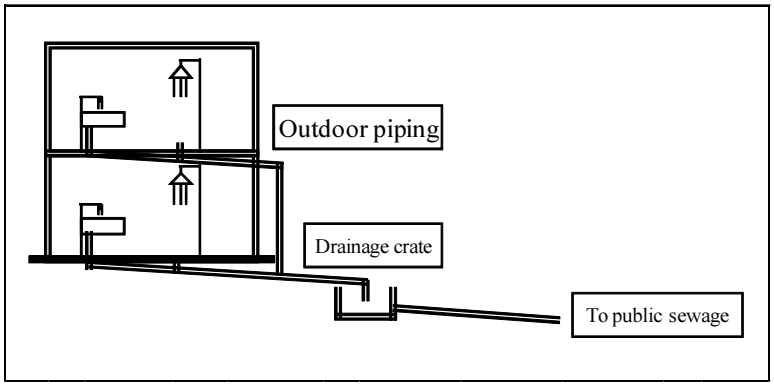


Figure 2.4 Schematic Diagram of Drainage System: Shartuz Central District Hospital

(ii) Jomi Central District Hospital:

No public drainage system is available near the hospital, so sewage water is currently discharged within the premises regardless of whether it is general or medical sewage water. To improve this situation, septic tanks and infiltration inlets are installed as drainage system.

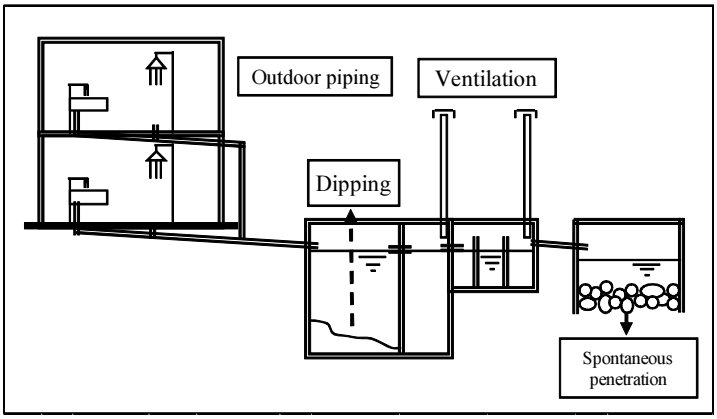


Figure 2.5 Schematic Diagram of Drainage System: Jomi Central District Hospital

(iii) The following points are noted when septic tanks are installed.

- To avoid clogging of pipes, the septic tanks are installed near the facilities to minimize the total length of pipes.
- To reduce the construction cost, the inhalant canal is constructed as shallow as possible.

2) Selection of the Capacity of Septic Tank

Approximately 360 people use the facilities of Jomi Central District Hospital, so two 100-person capacity tanks are installed for each of the obstetric and pediatric wards.

Table 2.13 Size of Septic Tanks

Standard no. of users	a (mm)	b (mm)	c (mm)	d (mm)	e (mm)	f (mm)	Remarks
100	4,200	4,300	3,400	3,000	1,600	700	

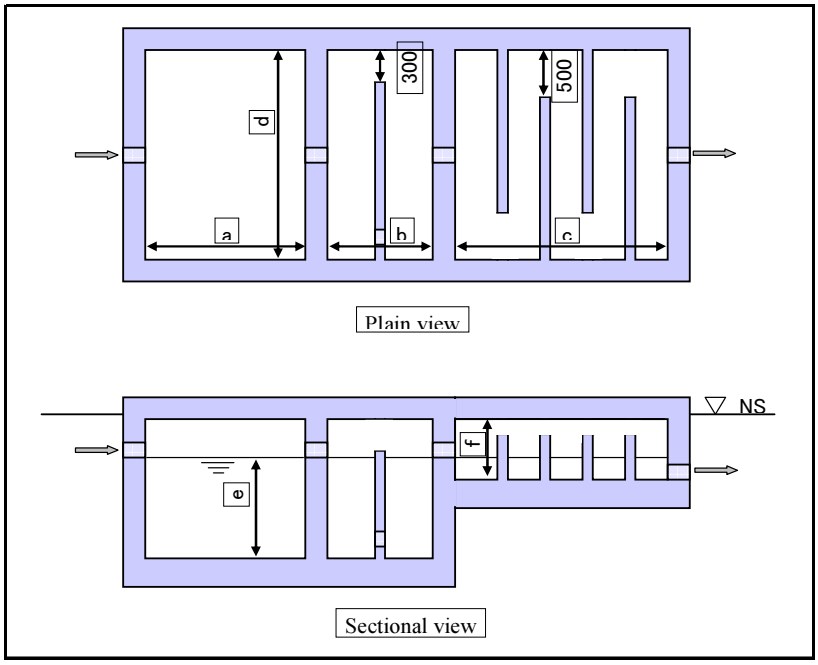


Figure 2.6 Schematic Diagram of Septic Tank

(3) Sanitary Fittings

1) Basic Plan

The existing sanitary fittings planned to be removed and new ones to be installed are listed below. Basically, water supply points are installed in wards and consulting rooms, and bathrooms and shower rooms are equipped with a hot-water supply system. Any bathroom or shower room without electricity supply will not be equipped with a hot-water supply system. All the existing washbowls and lavatory basins are removed. However the pipes will be disconnected and sealed at the close of the sanitary equipments, for the reason of necessity to protect the existing walls and floors from the damage of the pipe detachment.

Table 2.14 List of Quantity of Sanitary Fittings to Be Removed / Newly Installed: (Obstetric and Pediatric Ward of Shartuz Central District Hospital)

Room name	No. of rooms	Hot-water supply system		Washbowl		Bathtub		Drainage pipes for bathtub		Shower		Drainage pipes for toilet basin		Existing high tank		Western-style toilet basin	
		Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed
Entrance, hall and corridor	6																
Administrative office, etc.	10			1	1												
Library and reference room	4																
Reception of clinical consultation	1			1	1												
Rest room	4			1	1												
Changing room	4																
Storage and linen closet	15				1												
Kitchen and dining room	4			4	4												

Room name	No. of rooms	Hot-water supply system		Washbowl		Bathtub		Drainage pipes for bathtub		Shower		Drainage pipes for toilet basin		Existing high tank		Western-style toilet basin	
		Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed
Hot-water supply room	1			2	1												
Rooms of director, doctors and head nurse	19			0	15												
Operation room	4			0	0												
Delivery room	3			2	3												
Front room	2			4	4												
Operation preparatory room	1			2	1												
Recovery room	2				2												
Equipment storage	1			1	1												
Laboratory	3			2	2												
Blood storage room	1																
Examination room	1				1												
Blood sampling room	1																
Treatment room	5			3	5												
Injection room	3			1	3												
Lifestyle counseling room	1																
Counseling room	1				1												
Consultation room	3				1												
Evaluation room	1																
ICU	2				2												
Preparation room for breast-feeding	1				1												
Newborn room	1				1												
Sickroom	32			1	32												
Hand-wash station and toilet	13	1	1	8	6							10	10	12		10	10
Bathroom and shower room	9	5	5	5	5	6	6		6	5	6						
Total	159	6	6	38	95	6	6	0	6	5	6	10	10	12	0	10	10

Table 2.15 List of Quantity of Sanitary Fittings to Be Removed / Newly Installed: (Obstetric Ward of Jomi Central District Hospital)

Room name	No. of rooms	Hot-water supply system		Washbowl		Bathtub		Drainage pipes for bathtub		Shower		Drainage pipes for toilet basin		Existing high tank		Western-style toilet basin	
		Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed
Entrance hall and hall	3			1													
Reception	4																
Administration	1																
Rest room	2			1													
Changing room	3																
Storage	11																
Waiting room	1				1												
Rooms of doctors and head nurse	5				4												

Room name	No. of rooms	Hot-water supply system		Washbowl		Bathtub		Drainage pipes for bathtub		Shower		Drainage pipes for toilet basin		Existing high tank		Western-style toilet basin	
		Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed
Equipment storage	2				1												
Examination room	2				1												
Operation room	3				0												
Operation preparatory room	3				3												
Recovery room	2			1	2												
Treatment room	3			2	3												
Front room	8			4	2												
Injection room	2				2												
Ultrasonic examination room	1																
Delivery and special delivery room	3			1	2												
Infant room	1				1												
Sickroom	31			1	31												
Sickroom to be repaired	9				9												
Shower room	4		1	2	3		1		1		1						
Shower and hand-wash station	1			1	1												
Hand-wash station for operation room	1			1	1												
Toilet	3											2	3	3			3
Total	109	0	1	15	67	0	1	0	1	0	1	2	3	3	0	0	3

Table 2.16 List of Quantity of Sanitary Fittings to Be Removed / Newly Installed: (Pediatric Ward of Jomi Central District Hospital)

Room name	No. of rooms	Hot-water supply system		Washbowl		Bathtub		Drainage pipes for bathtub		Shower		Drainage pipes for toilet basin		Existing high tank		Western-style toilet basin	
		Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed
Entrance and entrance hall	3			1													
Reception	1				1												
Administrative office	1																
Reference room	1																
Storage	5																
Pharmacy	2																
Rooms of doctors and head nurse	9			1	9												
ICU	1																
Plaster room	1																
Shower room	1																
Laboratory	1				1												
Rest room	2			1	1												

Room name	No. of rooms	Hot-water supply system		Washbowl		Bathtub		Drainage pipes for bathtub		Shower		Drainage pipes for toilet basin		Existing high tank		Western-style toilet basin	
		Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed	Removal	Newly installed
Dining room	1																
Changing room	3																
Operation room	2																
Front room	1			2	2												
Preparatory room	2				2												
Blood sampling room	1			1													
Postoperative treatment room	1			1	1												
Recovery room	2				2												
Treatment room	4			1	2												
Washing room	2			1	2												
Injection room	1				1												
Sickroom	29			1	28												
Classroom	11																
Total	88	0	0	10	52	0	0	0	0	0	0	0	0	0	0	0	0

(4) Electricity System

1) Basic Plan

The electricity system for the hospitals is planned as follows.

(i) Shartuz Central District Hospital:

Electricity line is connected to the distribution board in the existing pump room to transmit electricity to each pump via the distribution board in the newly installed pump room. The newly installed pump room is equipped with minimum necessary lighting and electric outlets for maintenance.

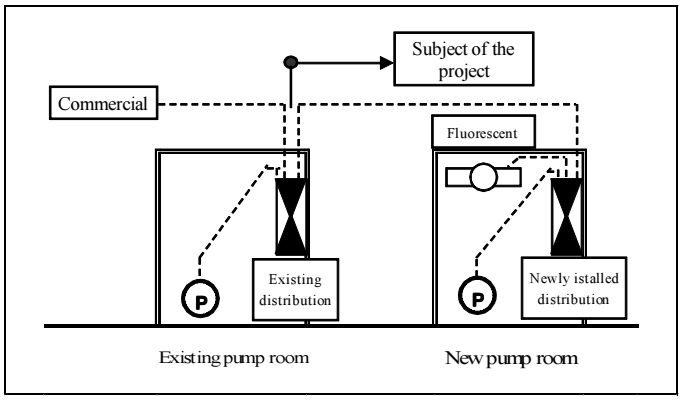


Figure 2.7 Schematic Diagram of Electricity System: Shartuz Central District Hospital

(ii) Jomi Central District Hospital:

Electricity poles are newly installed on the premises and connected to the neighboring existing poles to transmit electricity to the distribution board in the newly constructed receiving tank pump room, that

supply electricity to each pump. The newly constructed receiving tank pump room is equipped with adequate necessary lighting fixtures and electric outlets for maintenance.

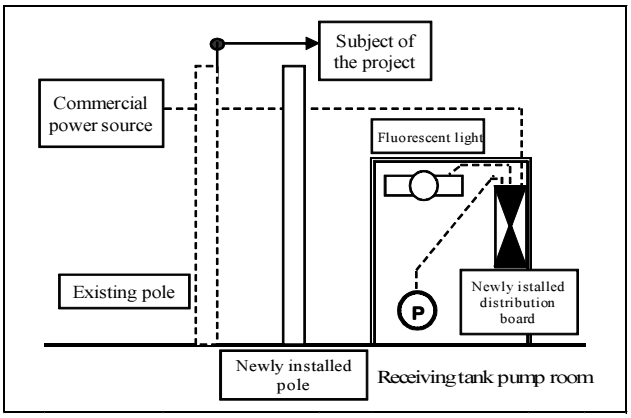


Figure 2.8 Schematic Diagram of Electricity System: Jomi Central District Hospital

(iii) Khatlon Oblast Provincial Hospital:

Electricity is transmitted from the generator to be procured as medical equipment. Each corridor, newborn room, injection room and treatment room are equipped with lighting fixtures and electric outlets to receive electricity during outages or emergency.

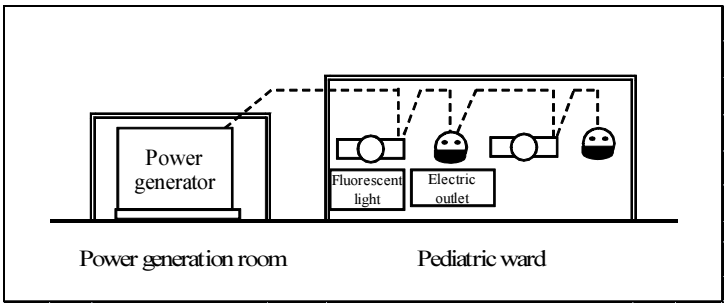


Figure 2.9 Schematic Diagram of Electricity System: Khatlon Oblast Provincial Hospital

2-2-2-3 Construction Plan

(1) Pump Room, etc. (Pump room and receiving tank pump room)

The pump room of Shartuz Central District Hospital comprises a pump room (2 pumps) for the elevated tank and a maintenance room, while the receiving tank pump room of Jomi Central District Hospital comprises a pump room to install a well pump, primary receiving tank and storage pump for the elevated tank, and a maintenance room.

(2) Elevated Tank

The elevated tank is steel-structure, and the maintenance space for cleaning of the tank and other maintenance work and beams for replacement of the tank in future are designed. For easy regular maintenance, the tank is equipped with stairs rather than ladders. To prevent access of outsiders, no stairs are built at the lowermost layer.

(3) Power Generation Room

The power generation room is steel-structure, the walls are made of wire mesh, and the roof takes the colored metal rib sheet on steel structure.

(4) Total Floor Area of the Facilities

The floor areas of the facilities are listed below.

Table 2.17 Total Floor Areas of the Facilities

	Hospital	Ward	Area (m^2)	No. of wards	Total floor area (m^2)	Subtotal (m^2)
Repair	Shartuz Central District Hospital	Obstetric and pediatric ward	3767.48	1	3767.48	10,948.67
	Jomi Central District Hospital	Obstetric ward	2074.84	1	2074.84	
		Pediatric ward	2530.06	1	2530.06	
	Khatlon Oblast Provincial Hospital	Pediatric ward	2576.29	1	2576.29	
Newly Installed	Shartuz Central District Hospital	Pump room	42.0	1	42.00	433.10
		Elevated tank	20.08	1	20.08	
	Jomi Central District Hospital	Receiving tank pump room	96.0	1	96.00	
		Elevated tank	12.05	2	24.10	
		Septic Tanks	60.95	4	243.8	
	Khatlon Oblast Provincial Hospital	Power generation room	6.60	1	6.60	
Total floor area of the facilities						11,381.77

(5) Cross-Sectional Plan

For heat insulation in cold winter, brick masonry commonly used in the country are used for the walls of pump rooms, etc., and the roof, walls and floors of the tank room of the elevated tank are covered by heat health safety-approved insulating materials.

2-2-2-4 Structure Plan

Structures to be newly built in this Project are elevated tanks, pump rooms (pump room and receiving tank pump room), etc. and power generation room. For the elevated tank and power generation room, the steel brace structure commonly used in the country is adopted. For the pump room etc., reinforced-concrete are used for the main structure and bricks for the walls.

The soil condition is thick layer of fine-grained argillaceous soil. A special feature of these grounds is that the surface layer of 1m or so is fairly hard in the dry season, but the surface of 30cm or so holds water and loses hardness in the rainy season. On the other hand, the layer deeper than 1m contains water and is low in intensity even in the dry season.

Tajikistan and the neighboring countries have experienced earthquakes of magnitude 8 or higher in the past, so Tajikistan adopts standards for structural design (construction in earthquake-prone regions) formulated in the days of the former Soviet Union. The latest standards are, however, upgraded in the Russian Federation only. Thus, the structures in this plan are designed in conformity to the Building

Standards Act and various standards for structural designs issued by the Architectural Institute of Japan and other relevant organizations in Japan, which is another earthquake-prone country.

(1) Structural Type

As for the superstructure, those commonly used in Tajikistan are used: the steel brace structure for the elevated tank; the reinforced-concrete rigid-frame structure for the pump room (brick masonry for walls); the steel angle brace rigid-frame structure for the power generation room. The spread foundation structure is adopted for the basic structure.

Table 2.18 Structural Types

C	Part	Structural class	Structural type	Remarks
Elevated tank	Foundation	Reinforced-concrete	Spread foundation	Gravel substitute underneath the foundation
	Main Structure	Steel-frame	Brace structure	
	Floor	Steel-frame		Checkered plate
	Roof	Steel-frame		Colored metal rib sheet
	Wall	Steel-frame		Colored metal rib sheet
Pump room, etc.	Foundation	Reinforced-concrete	Spread foundation	
	First floor	Reinforced-concrete	Grade Concrete slab	
	Roof	Reinforced-concrete	Half PC slab structure	
		Steel-frame	Tie-bar structure	Colored metal rib sheet
	Wall	Brick masonry	Masonry structure	
	Column, girder and circumferential girder	Reinforced-concrete	Rigid-frame structure	
Power generation room	Foundation	Reinforced-concrete	Spread foundation	
	Main Structure	Steel-frame	Angle brace rigid-frame structure	
	Floor	Reinforced-concrete		
	Roof	Steel-frame		Colored metal rib sheet
	Wall	Steel-frame		Wire mesh

(2) Load

1) Basic Load

A summary of basic load is listed in the following table.

Table 2.19 Basic Load

Load term		Load		Remarks
Permanent Load	Dead load	Weight of concrete	23.5 kN/m^3	
		Weight of reinforced-concrete	24.5 kN/m^3	
		Weight of reinforcing bar and steel beam	78.5 kN/m^3	
	Live load	Pump room, etc.	3.00 kN/m^2	Live load is set to be zero for roof since snow load is taken into account.
		Deck and stairs of elevated tank	1.30 kN/m^2	
		Roof (Colored metal rib sheet, reinforced-concrete)	Not taken into account	
Temporary Load	Wind load	0.40 kN/m^2 (height: H≦100m)		
	Snow load	0.70 kN/m^2		
	Seismic load	C_0 = 0.20		Importance factor: 1.5

2) Seismic Load

The estimated maximum acceleration of the ground surface of the sites of this plan in accordance with records of earthquakes in the past (International Institute of Seismology and Earthquake Engineering) and in consideration of distance attenuation is 123 - 193gal according to the following formula.

$$\alpha_{max} = 5/\sqrt{(TG)} \times 10^{0.61M-1.73\log 10x+0.18}$$

Table 2.20 Maximum Acceleration on the Sites of the Plan Estimated based on Past Earthquakes

Subject site	Epicenter					Distance to seismic center	Estimated acceleration
	Date of occurrence	North latitude	East longitude	M	Country		
Shartuz	1921.11.15	36.5	70.5	8. 1	Afghanistan	228.2 km	123 gal
Jomi	1907.10.21	38.7	67.9	7.4	Uzbekistan	99.7 km	193gal

3) Combination of Loads

The following table lists combinations of loads and increase of allowable stress.

Table 2.21 Load Combination

Load term	Load Combination	Increase of allowable stress
Permanent Load	Dead load + live load	1.00
Temporary load	Dead load ＋ (live load) + wind load	1.50
	Dead load ＋ live load ＋ seismic load	
	Dead load ＋ live load ＋ snow load	

(3) Materials to Be Used

Major materials to be used are listed in the following table.

Table 2.22 Materials to Be Used

Material		Standards, etc.	
Cement		Normal Portland cement	
Sand		Local river sand	
Gravel		Local gravel stone	
Concrete*1		B25 (Normal concrete: 25kN/mm^2)	Design strength: Fc14
Reinforcing bar	Deformed bar	JIS G3112 SD345 (fy=345 N/mm^2) or	
		Equivalents to GOST 5781-82 A-I (A240) fy=235N/mm^2、ft=373N/mm^2	
Steel frame		JIS G3101 SS400 (t≦16mm : fy=245N/mm^2) (16＜t≦40mm : fy=235N/mm^2) or Equivalents to GOST 27772-88 C235 (t＜20mm : fy=235N/mm^2、ft=360N/mm^2) (t≧20mm : fy=225N/mm^2、ft=360N/mm^2)	

Notes) *1: The standard concrete strength in Tajikistan is 15, 20, 25kN/mm^2 (cube strength *2). The design strength is 14kN/mm^2, taking into account the temperature correction due to hot weather and other factors (6kN/mm^2).

*2: The cylinder strength of concrete is 80% of cube strength.

(4) Calculation of Bearing Capacity of Soil for Design

Based on reports on soil investigation, the bearing capacity of soil in Shartuz and Jomi are set as follows.

Shartuz GL-2,000mm allowable bearing capacity of soil for permanent load : 60 kN/m^2

Jomi GL-2,000mm allowable bearing capacity of soil for permanent load : 50 kN/m^2

2-2-2-5 Construction Material Plan

A construction method familiar to local construction company is adopted, and materials which can be procured in Tajikistan are used in consideration of constraints of construction, and maintenance and administration after completion of construction.

(1) Materials for Outside Finishing

- Roof: In principle, Half PC (Precast Concrete) slab method which is common on site is applied to finishing of the roof of the pump room, etc. as heat insulating measure. The concrete slab structure is covered by mineral surfaced roll roofing, and by Colored metal rib sheet.

  For the roofs of the elevated tanks and power generation rooms, steel beams are laid, covered by Colored metal rib sheet.

- Outside wall: The outside walls of the pump room, etc. are made of bricks, commonly used in the country and finished with mortar trowel and painting. As for procurement of concrete, a number of concrete plants are in operation in Tajikistan. In consideration of the volume of concrete to be used for the planned buildings, the cost of transportation by special vehicles and the time required for transportation, a small mixer is installed to mix concrete on the construction sites.

The outside walls of the elevated tanks are steel-framed and covered by Colored metal rib sheet.

The outside walls of the power generation room are made of mesh wire.

(2) Materials for Interior Finishing

- Floor: RC floors are finished with mortar.
  Steel frame floors are finished with checkered plate outdoor and wooden-based materials indoor.
- Wall: RC walls (bricks) are finished with mortal trowel and painting.
  Steel frame walls are finished with plywood board and painting
- Ceiling: Reinforced concrete slab roofs are finished with mortar trowel and painting. No ceiling is hanged.
  Steel frame roofs are finished with plywood board and painting.
- Fitting: Fittings used indoor and outdoor are steel.

The finishing materials described above and the relevant construction methods are listed in Table 2.23.

Table 2.23 Finishing Materials and Methods

Part		Local method	Method adopted	Reason of adoption
Roof	RC	Heat insulating materials are laid on concrete slab. For waterproofing, mineral surfaced roll roofing or folded-plate is used.	The local method	Locally common method
	Steel frame	Colored metal rib sheet	The local method	Light weight and high durability
Outside wall	RC	Finished with mortar and painting	The local method	Locally common method
	Steel frame	Colored metal rib sheet	The local method	Locally common method
Floor	RC	Finished with mortar	The local method	Locally common method
	Steel frame	Checkered plate and wooden floor	The local method	Locally common method
Inside wall	RC	Finished with mortar and painting	The local method	Locally common method
	Steel frame	Finished with plywood board and painting	The local method	Locally common method
Ceiling	RC	Finished with mortar and painting	The local method	Locally common method
	Steel frame	Finished with plywood board and painting	The local method	Locally common method
Fitting		Steel fittings	The local method	Locally common method

2-2-3 Outline Design Drawing

Outline of the designs are shown in the followings:

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No.	Title
Figure 2.10	Shartuz Central District Hospital Whole Layout Plan
Figure 2.11	Jomi Central District Hospital Whole Layout Plan
Figure 2.12	Shartuz Central District Hospital / New construction Pump room
Figure 2.13	Shartuz Central District Hospital / New construction Elevated tank
Figure 2.14	Jomi Central District Hospital / New construction Receiving tank pump room Plan & Sec.
Figure 2.15	Jomi Central District Hospital / New construction Receiving tank pump room Elevation
Figure 2.16	Jomi Central District Hospital / New construction Elevated tank
Figure 2.17	Jomi Central District Hospital / New construction Septic tank
Figure 2.18	Shartuz Central District Hospital / renovation Obstetric and Pediatric Ward 1st Floor Plan / Water supply and drainage plan
Figure 2.19	Shartuz Central District Hospital / renovation Obstetric and Pediatric Ward 2nd Floor Plan / Water supply and drainage plan
Figure 2.20	Shartuz Central District Hospital / renovation Obstetric and Pediatric Ward Drainage pipe exterior laying elevation plan 1
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Figure 2.22	Shartuz Central District Hospital / renovation Elevated tank / pump room pipe laying plan
Figure 2.23	Jomi Central District Hospital / renovation Obstetric Ward 1st Floor Plan / Water supply and drainage plan
Figure 2.24	Jomi Central District Hospital / renovation Obstetric Ward 2nd Floor Plan / Water supply and drainage plan
Figure 2.25	Jomi Central District Hospital / renovation Obstetric Ward Drainage pipe exterior laying elevation plan
Figure 2.26	Jomi Central District Hospital / renovation Pediatric Ward 1st Floor Plan / Water supply and drainage plan
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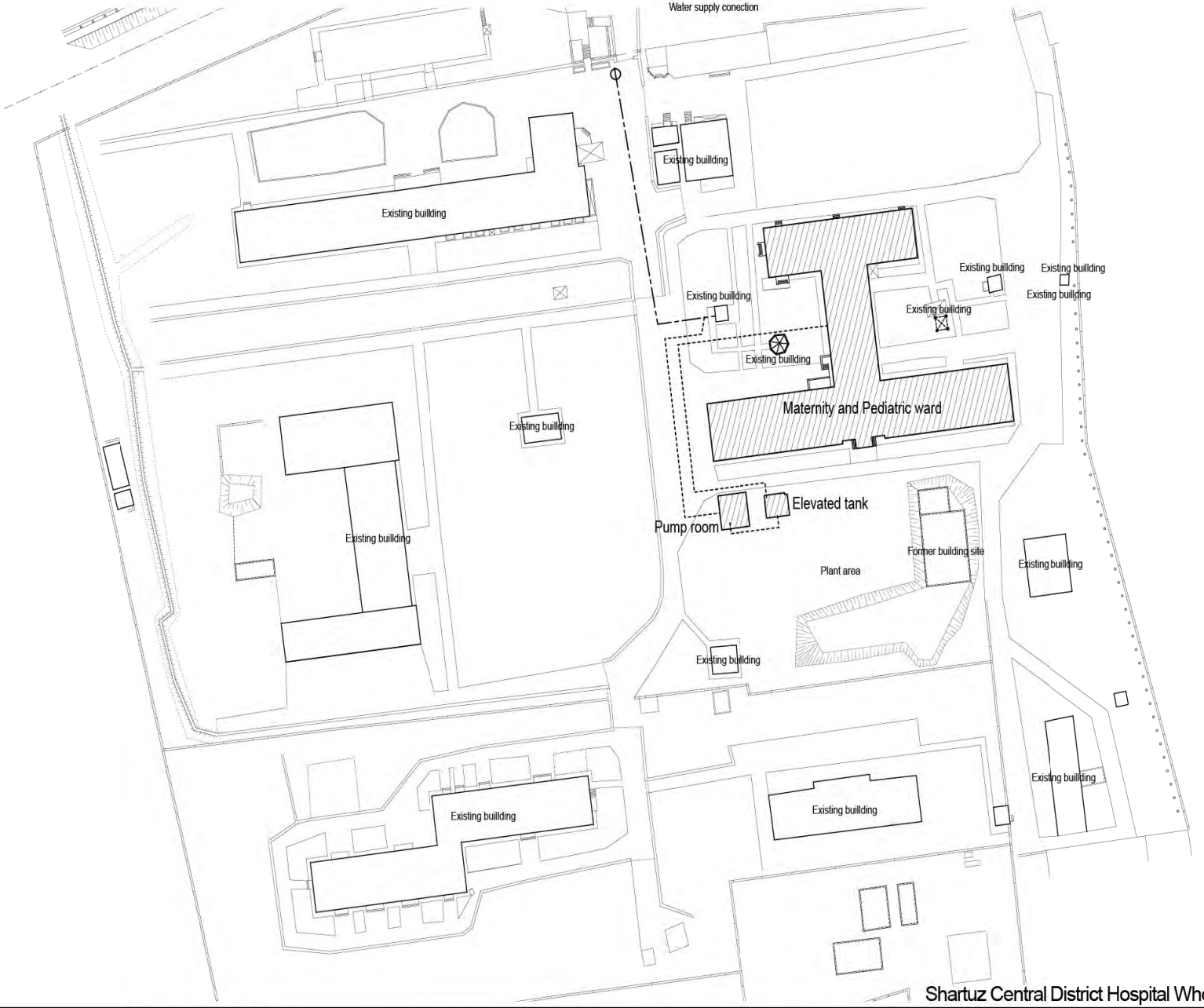
Figure 2.30	Khatlon Oblast Provincial Hospital Whole Layout Plan
Figure 2.31	Khatlon Oblast Provincial Hospital / New Construction Power generation room
Figure 2.32	Khatlon Oblast Provincial Hospital / renovation Pediatric Ward Electrical equipments installation plan 1
Figure 2.33	Khatlon Oblast Provincial Hospital / renovation Pediatric Ward Electrical equipments installation plan 2



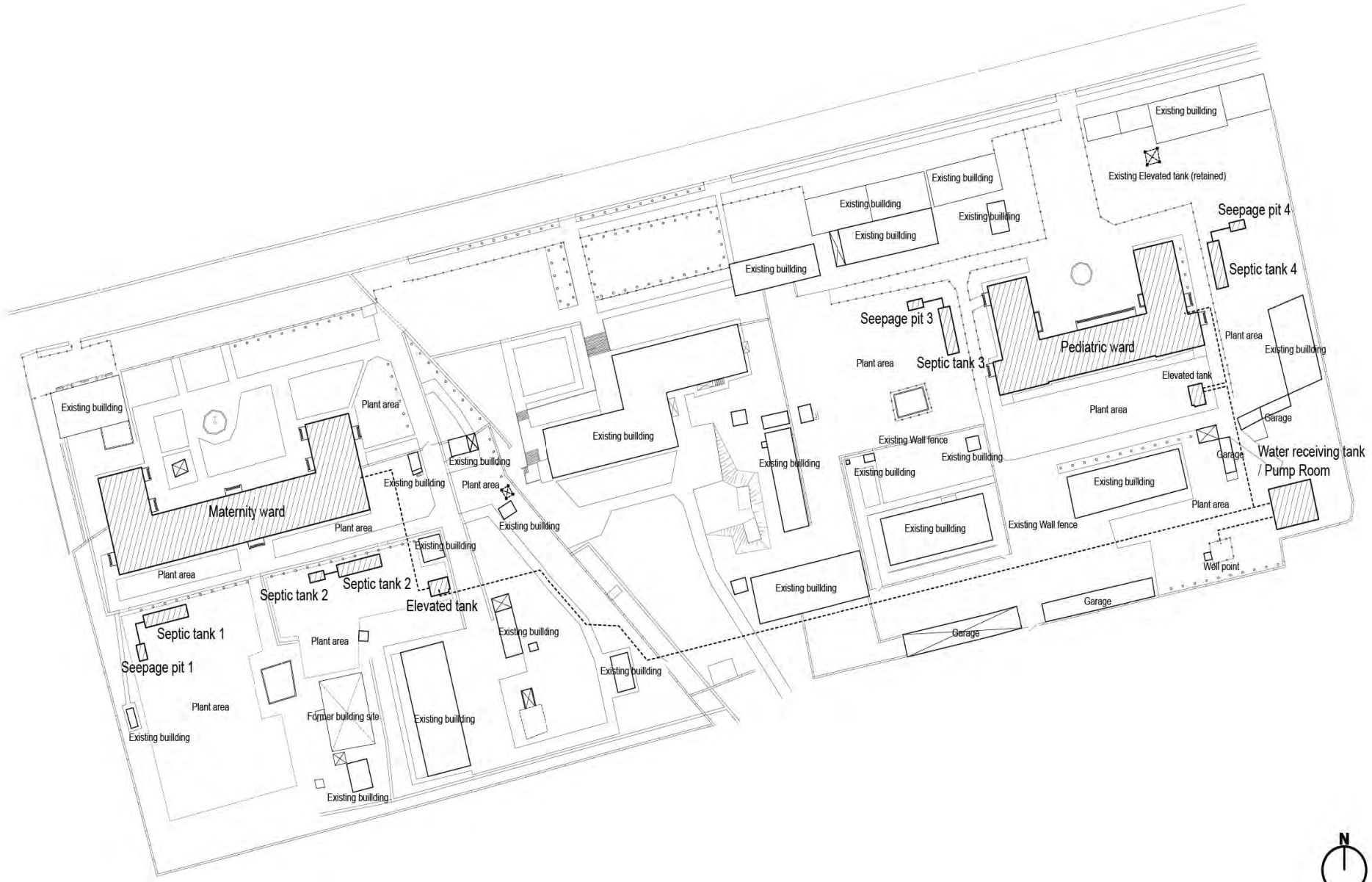
Shartuz Central District Hospital Whole Layout Plan

The Project for Improvement of Medical Equipment and
Water Supply and Drainage Facilities for Maternal and Child Health Care Institutions

0 25 50 75 100

Figure 2.10

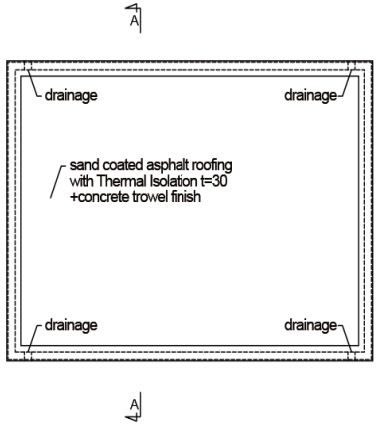
Figure 2.11



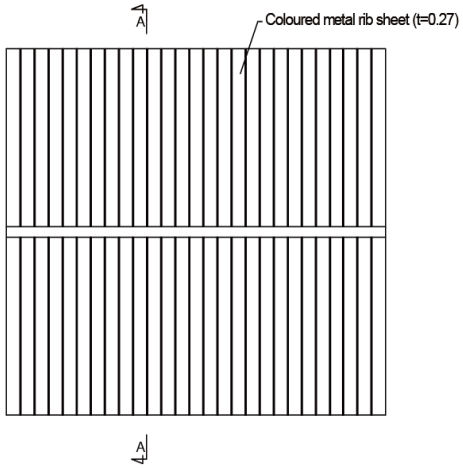
Jomi Central District Hospital Whole Layout Plan

The Project for Improvement of Medical Equipment and
Water Supply and Drainage Facilities for Maternal and Child Health Care Institutions

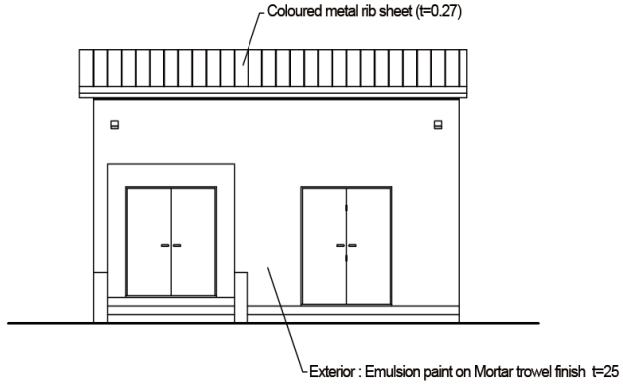
0 25 50 75 100



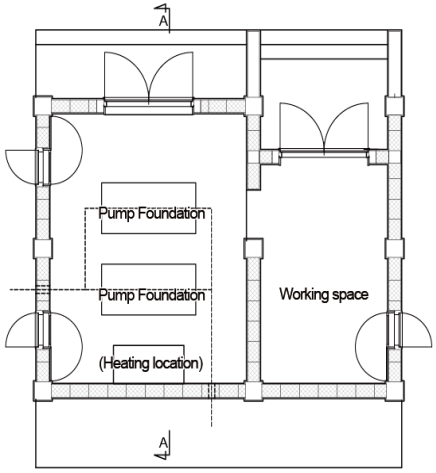
Roofing Plan 1



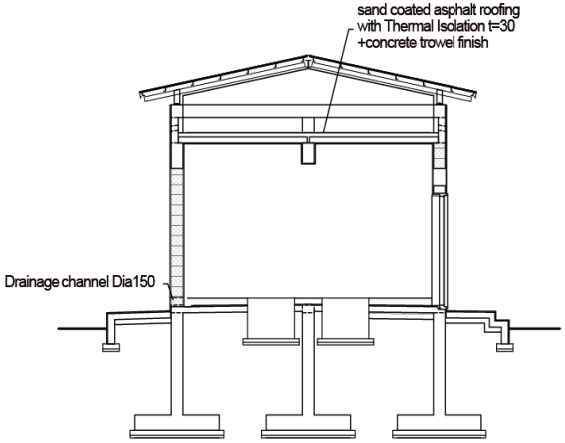
Roofing Plan 2



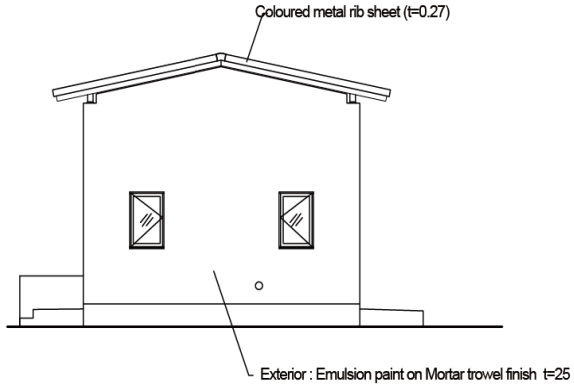
North Elevation



1st floor Plan



Section Plan A-A'



Ewst Elevation

Shartuz Central District Hospital / New construction
Pump room

Figure 2.12

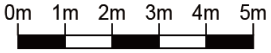
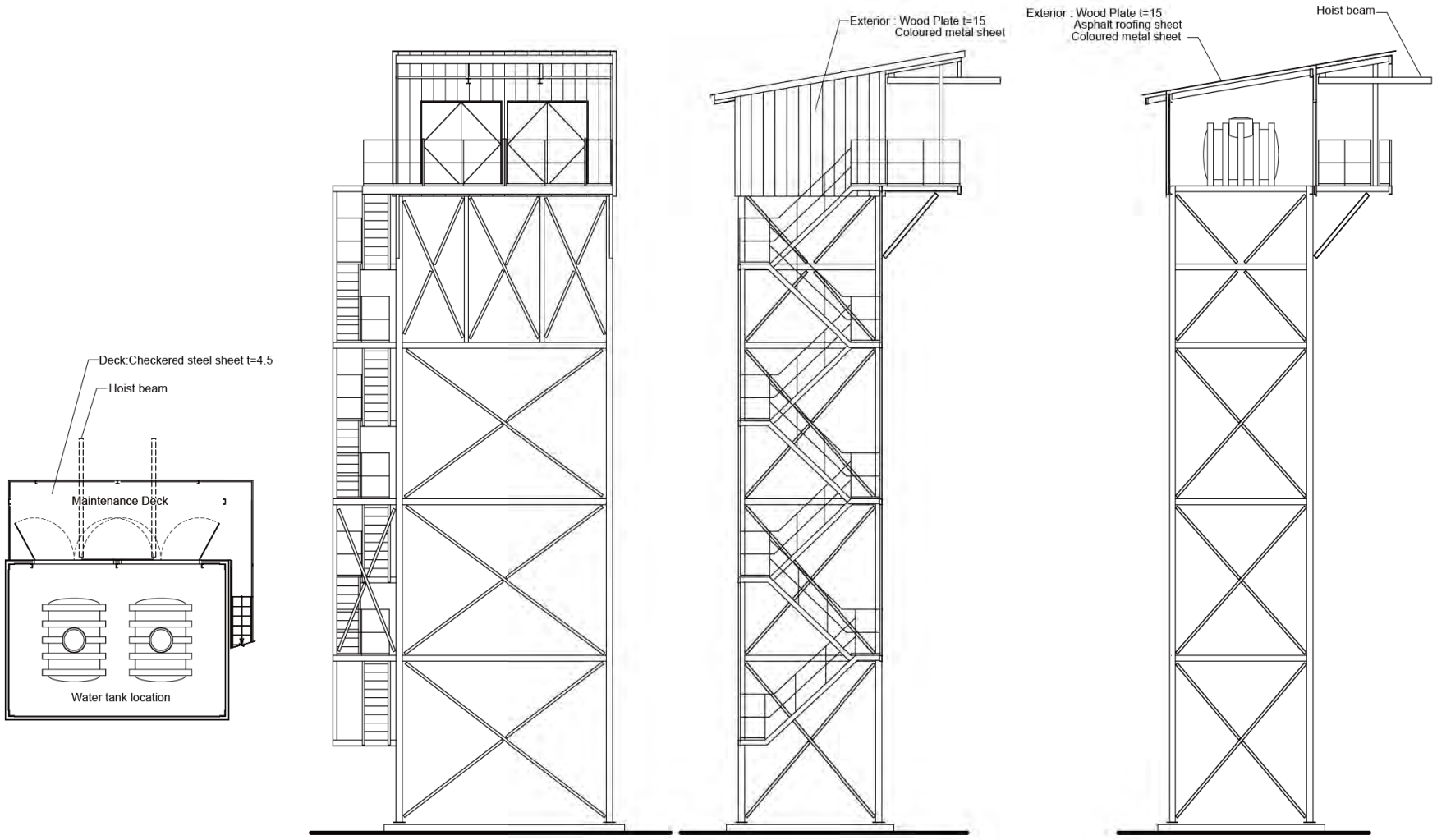


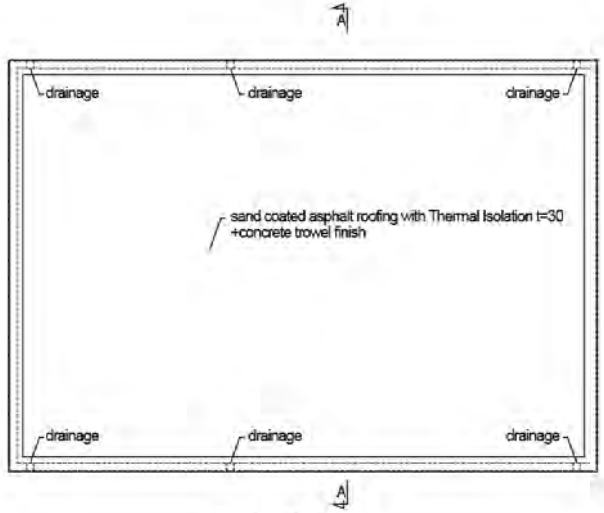
Figure 2.13



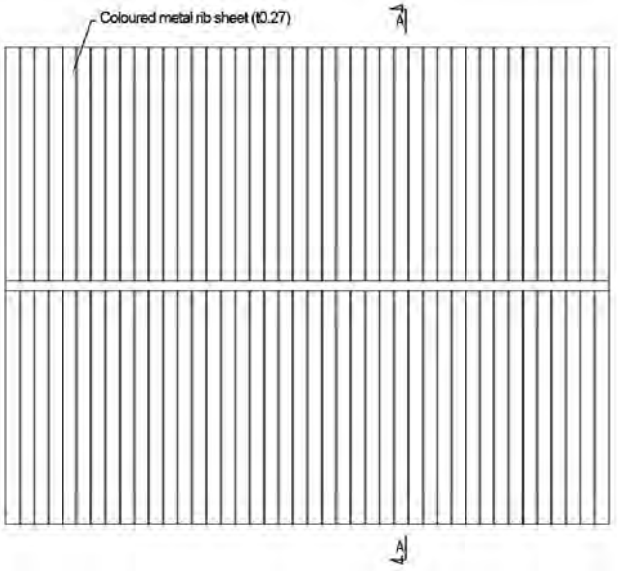
Ground Lever +15500 Floor Plan　　North Elevatin　　East Elevation　　Section Plan A-A'

Shartuz Central District Hospital / New construction
Elevated tank

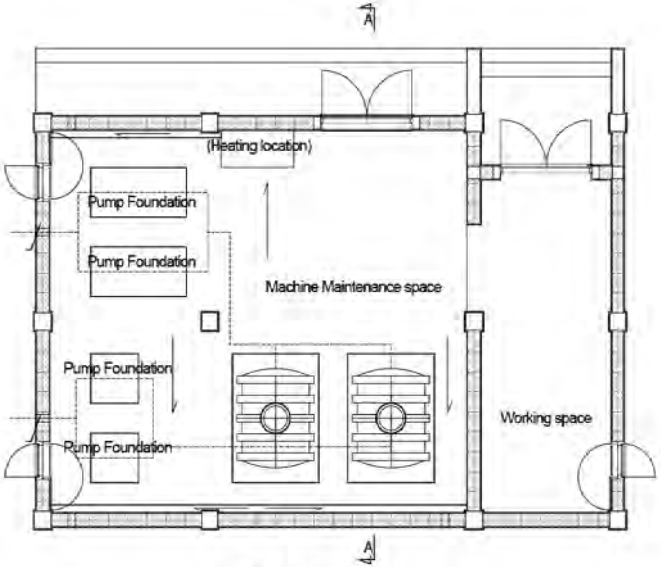
0m 1m 2m 3m 4m 5m



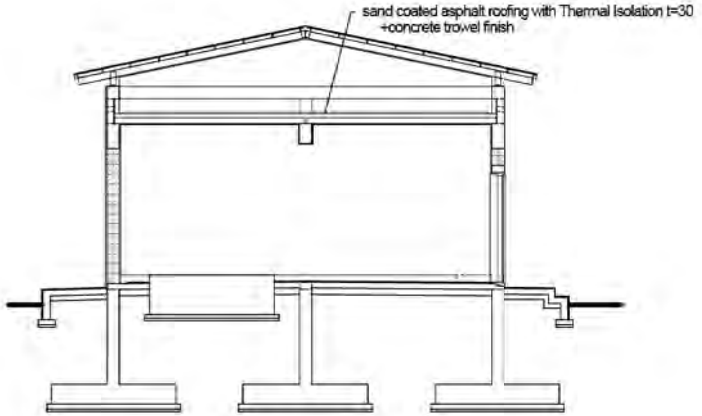
Roofing Plan 1



Roofing Plan 2



1st floor Plan



Section Plan A-A'

Jomi Central District Hospital / New construction
Receiving tank pump room Plan & Sec.

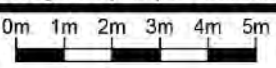
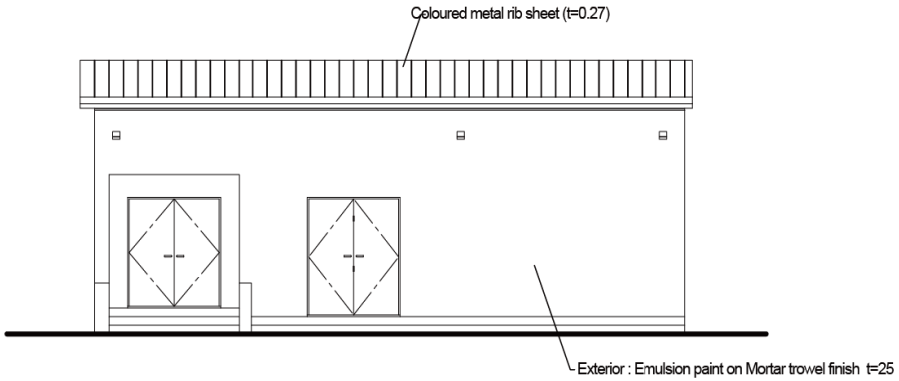
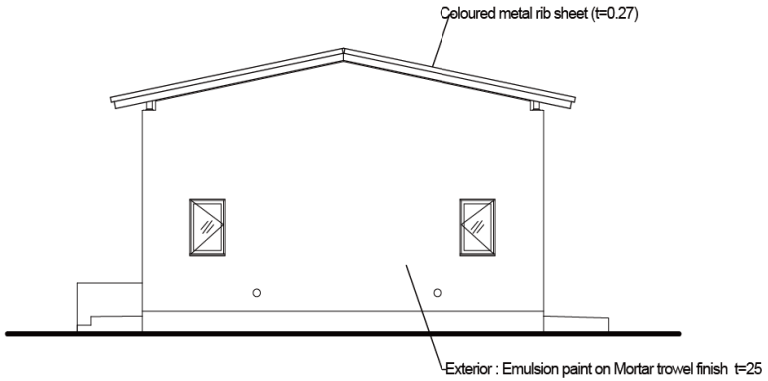


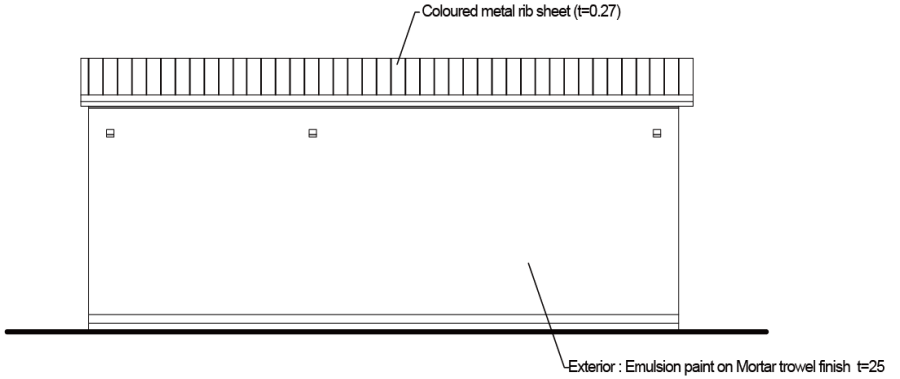
Figure 2.14



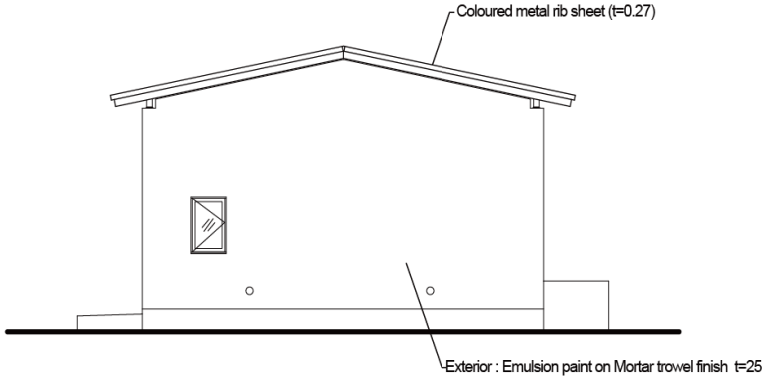
North Elevation



West Elevation



South Elevation

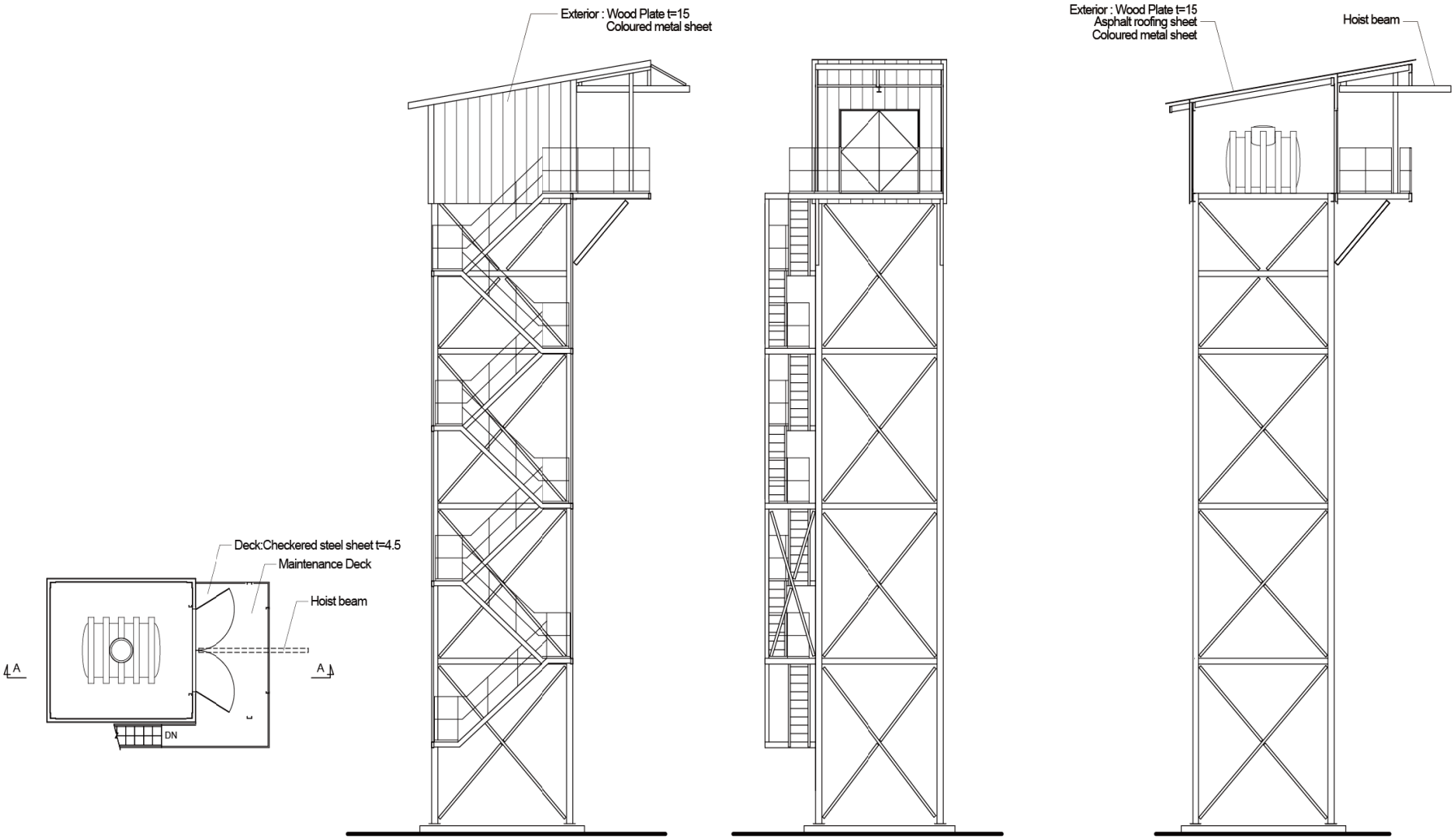


East Elevation

Jomi Central District Hospital / New construction
Receiving tank pump room Elevation

0m 1m 2m 3m 4m 5m

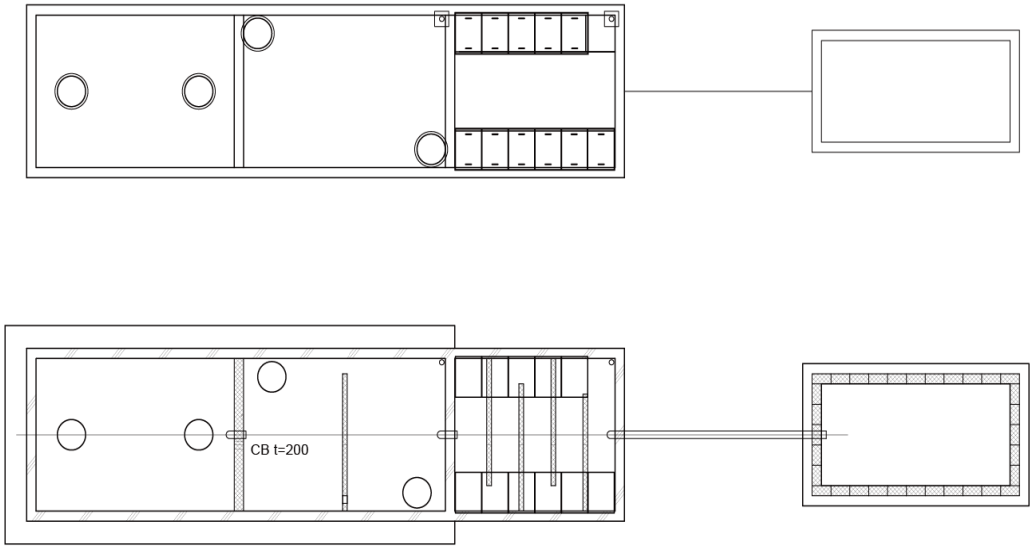
Figure 2.16



Jomi Central District Hospital / New construction
Elevated tank

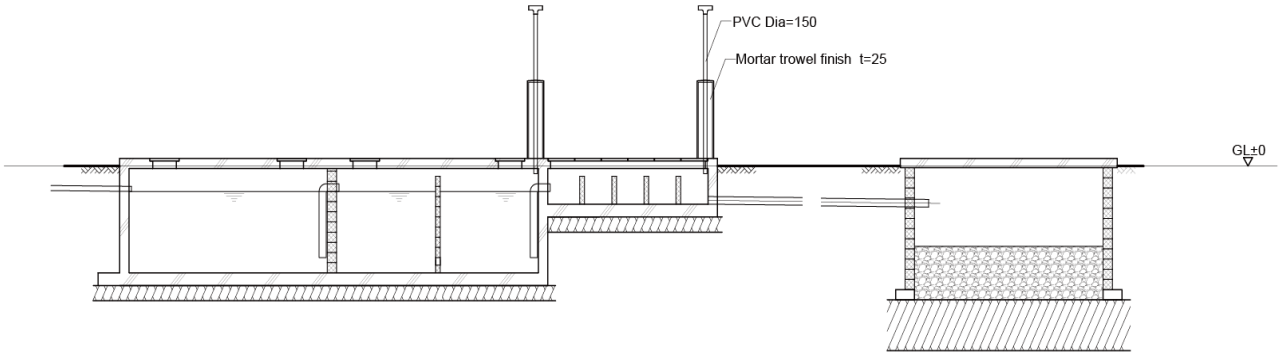
0m 1m 2m 3m 4m 5m

Figure 2.17



Septic tank (Cap. 130person) Plan

Seepage pit Plan



Septic tank (Cap. 130person) Section

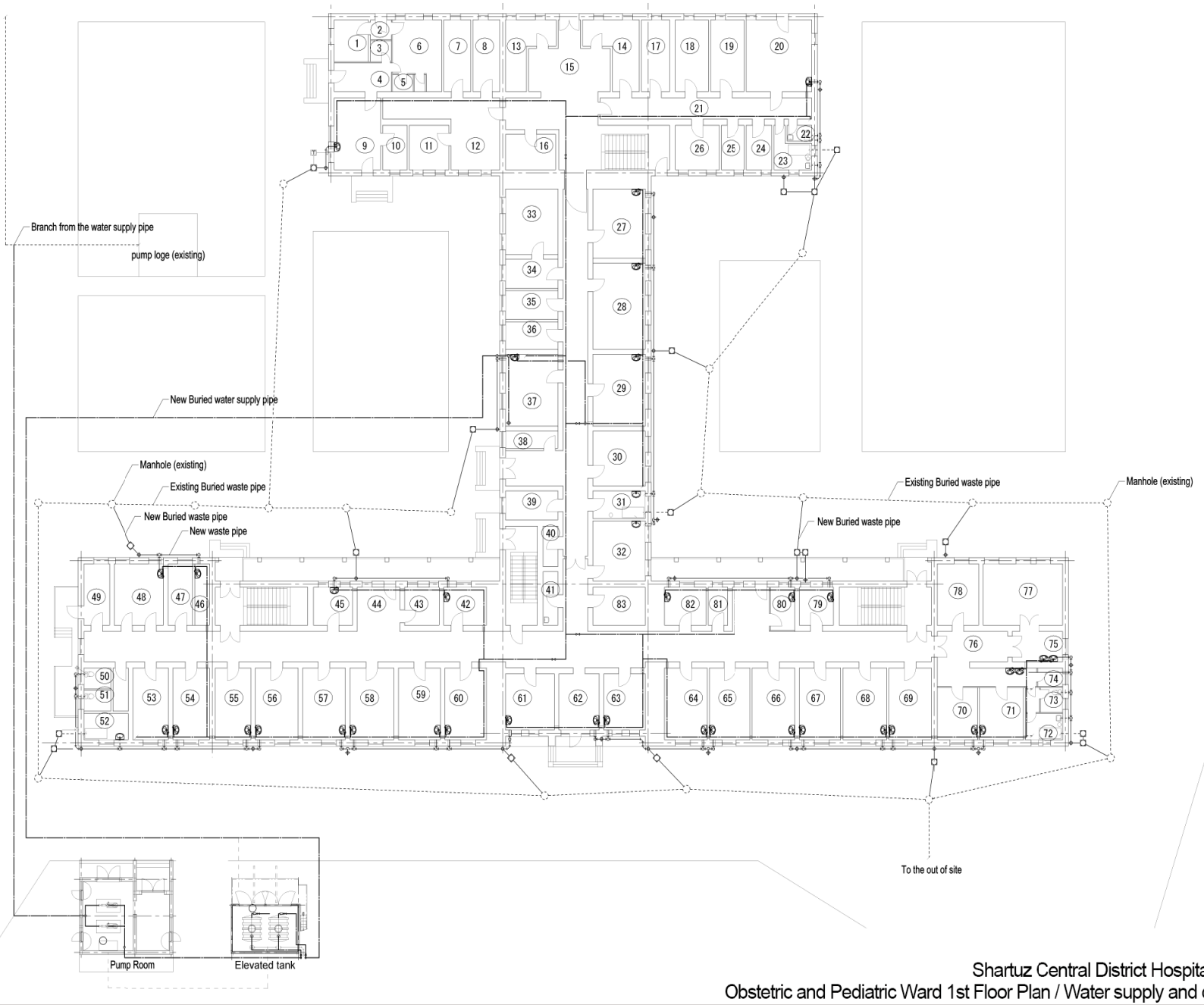
Seepage pit Section

N

Jomi Central District Hospital / New construction
Septic tank

0m 1m 2m 3m 4m 5m

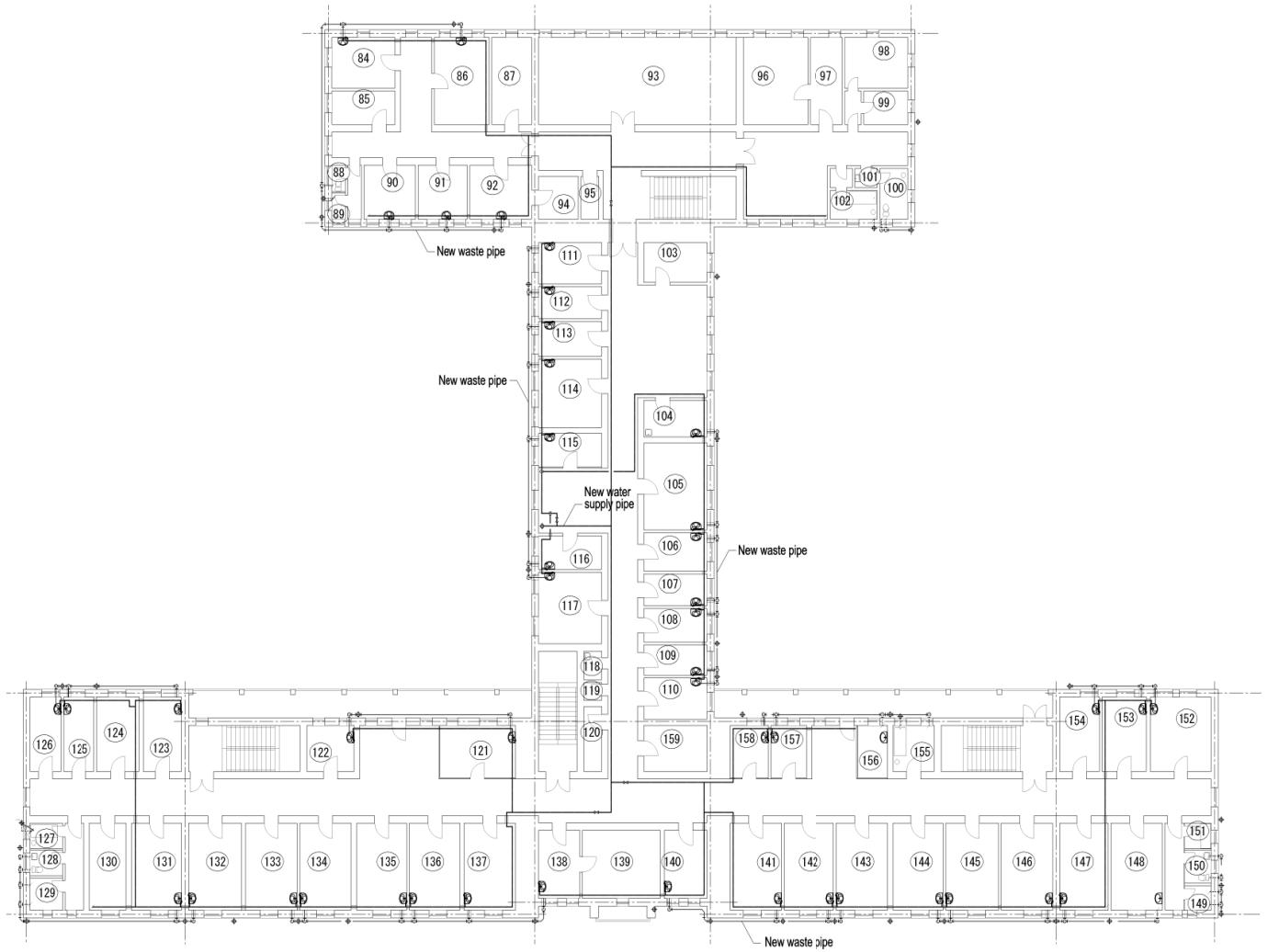
Figure 2.18



Shartuz Central District Hospital / renovation
Obstetric and Pediatric Ward 1st Floor Plan / Water supply and drainage plan

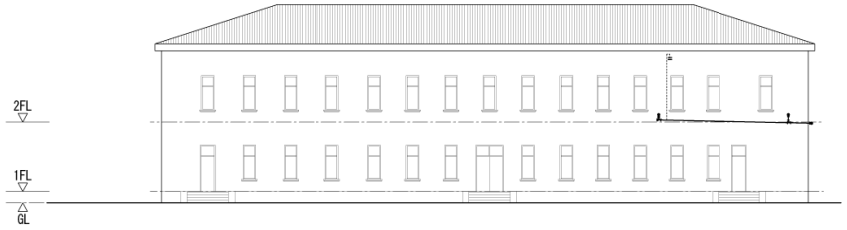
0m 3m 6m 9m 12m 15m

Figure 2.19

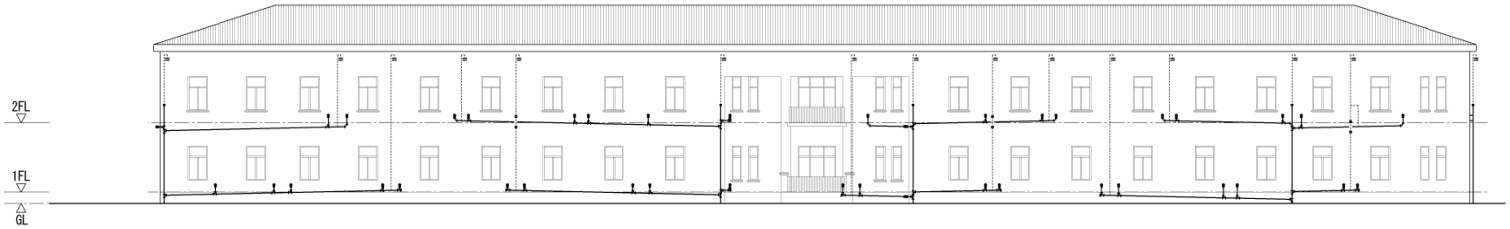


Shartuz Central District Hospital / renovation
Obstetric and Pediatric Ward 2nd Floor Plan / Water supply and drainage plan

0m 3m 6m 9m 12m 15m



North Elevation

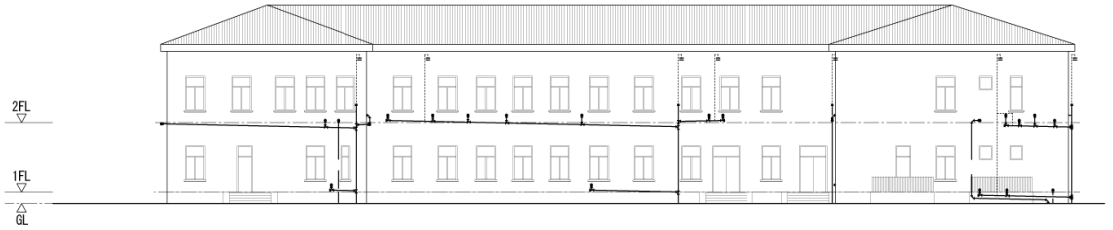


South Elevation

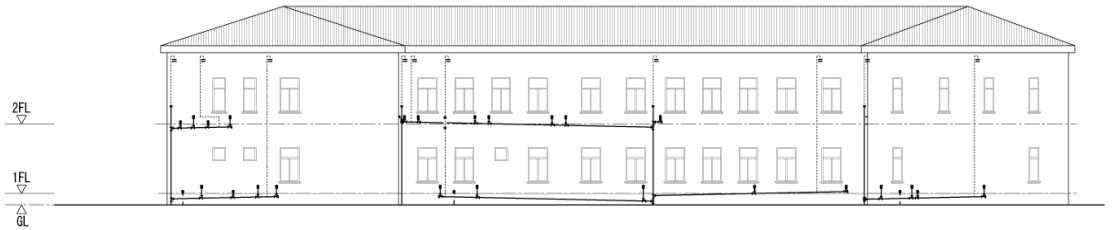
Figure 2.20

Shartuz Central District Hospital / renovation
Obstetric and Pediatric Ward Drainage pipe exterior laying elevation plan 1

0m 3m 6m 9m 12m 15m



West Elevation



East Elevation

Figure 2.21

Shartuz Central District Hospital / renovation
Obstetric and Pediatric Ward Drainage pipe exterior laying elevation plan 2

0m 3m 6m 9m 12m 15m

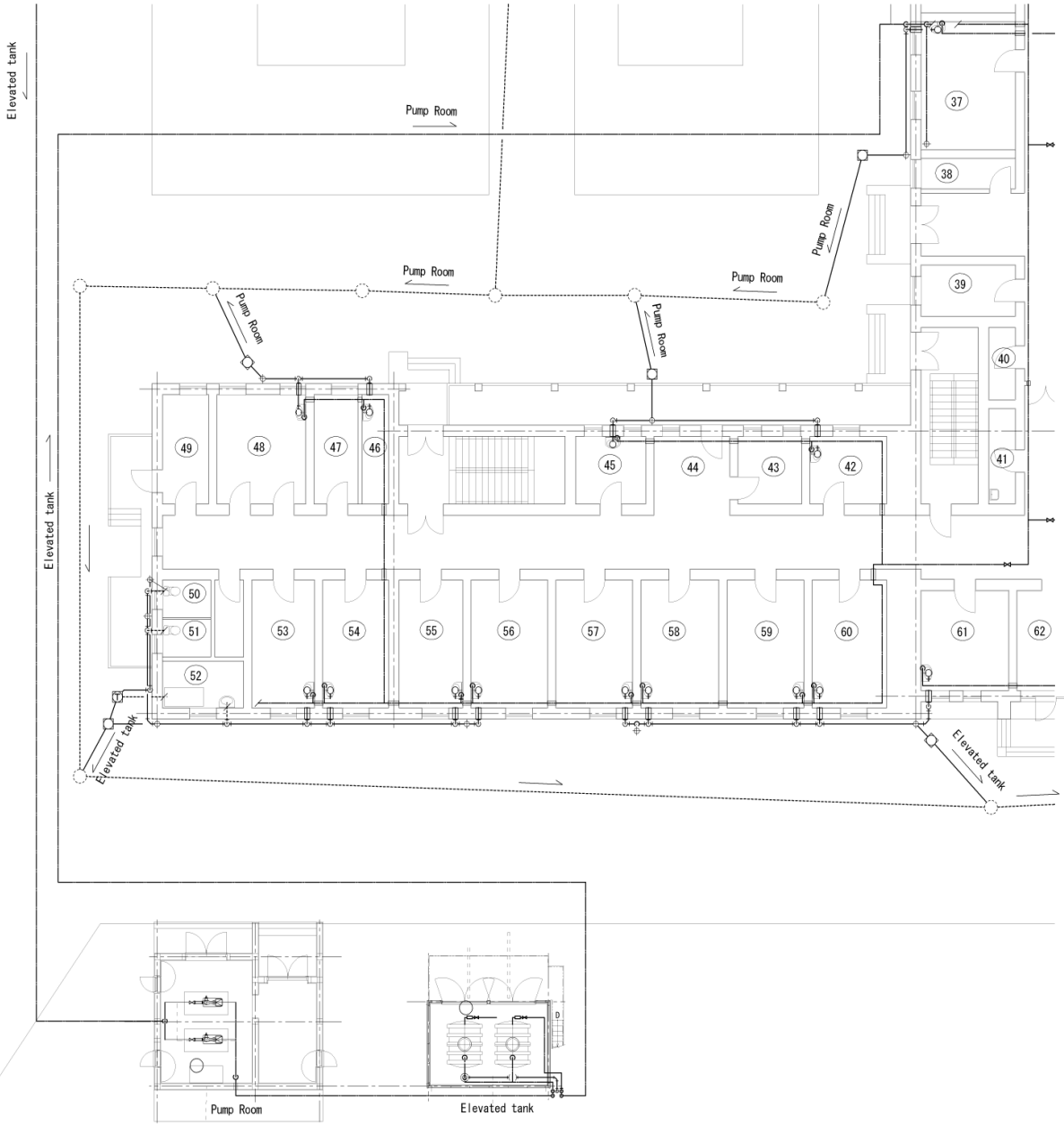
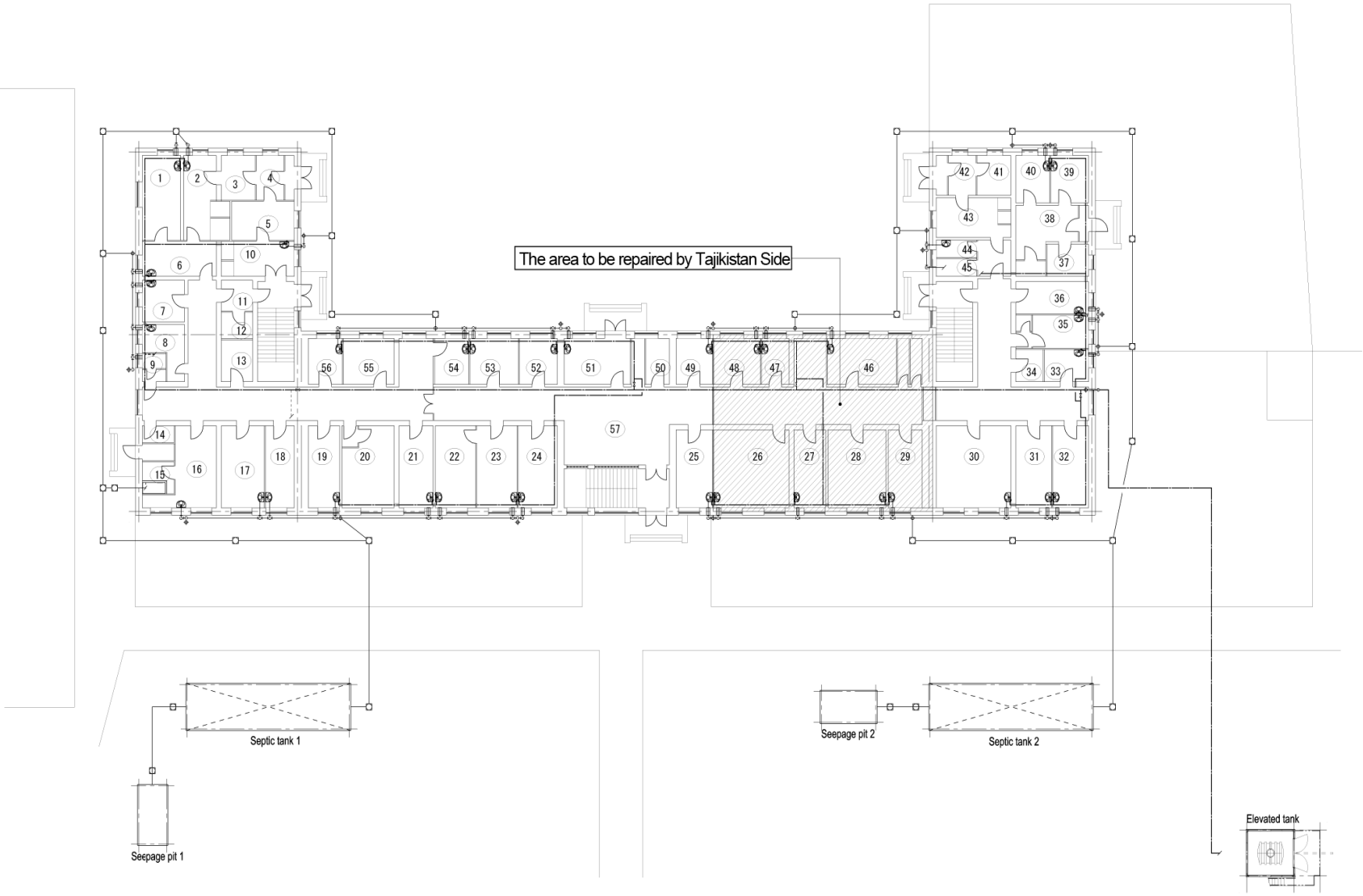


Figure 2.22

Shartuz Central District Hospital / renovation
Elevated tank / pump room pipe laying plan

0m 2m 4m 6m 8m 10m

Figure 2.23



Jomi Central District Hospital / renovation
Obstetric Ward 1st Floor Plan / Water supply and drainage plan

0m 3m 6m 9m 12m 15m

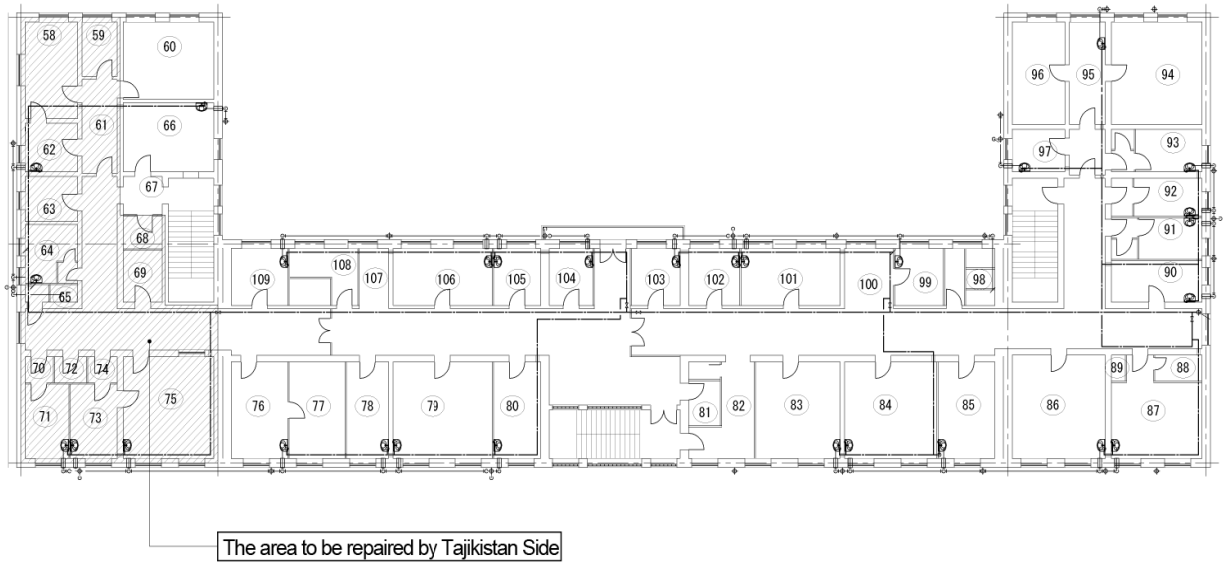
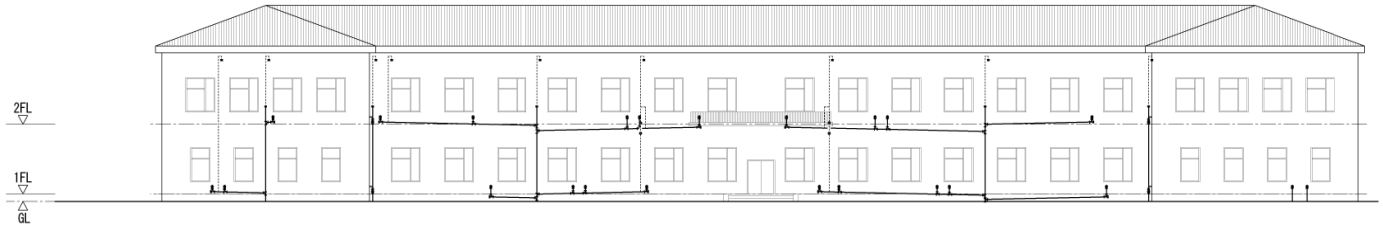


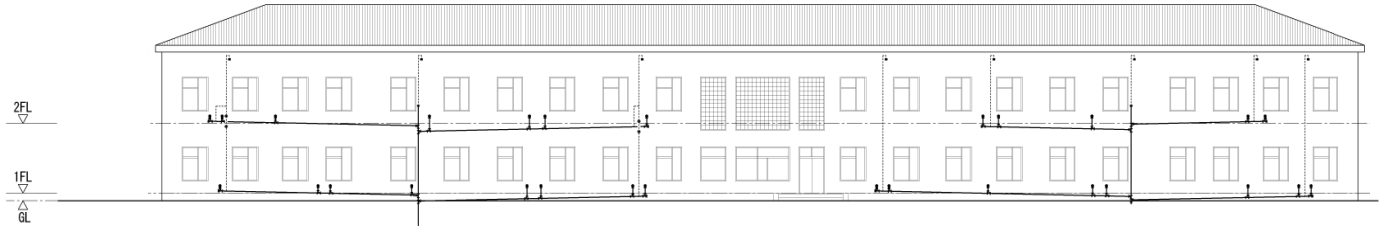
Figure 2.24

Jomi Central District Hospital / renovation
Obstetric Ward 2nd Floor Plan / Water supply and drainage plan

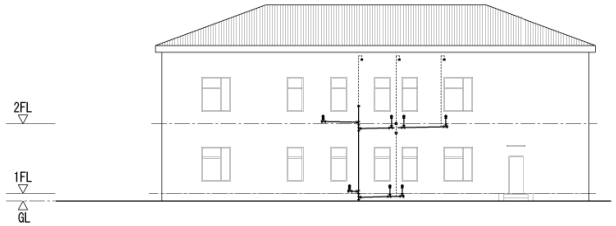
0m 3m 6m 9m 12m 15m



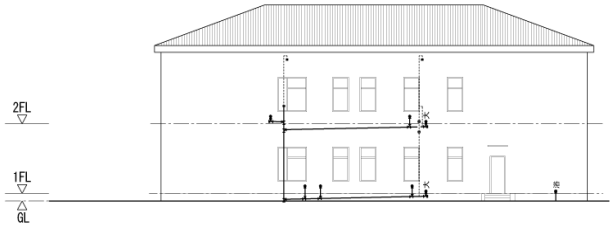
North Elevation



South Elevation



West Elevation



East Elevation

Figure 2.25

Jomi Central District Hospital / renovation
Obstetric Ward Drainage pipe exterior laying elevation plan

0m 3m 6m 9m 12m 15m

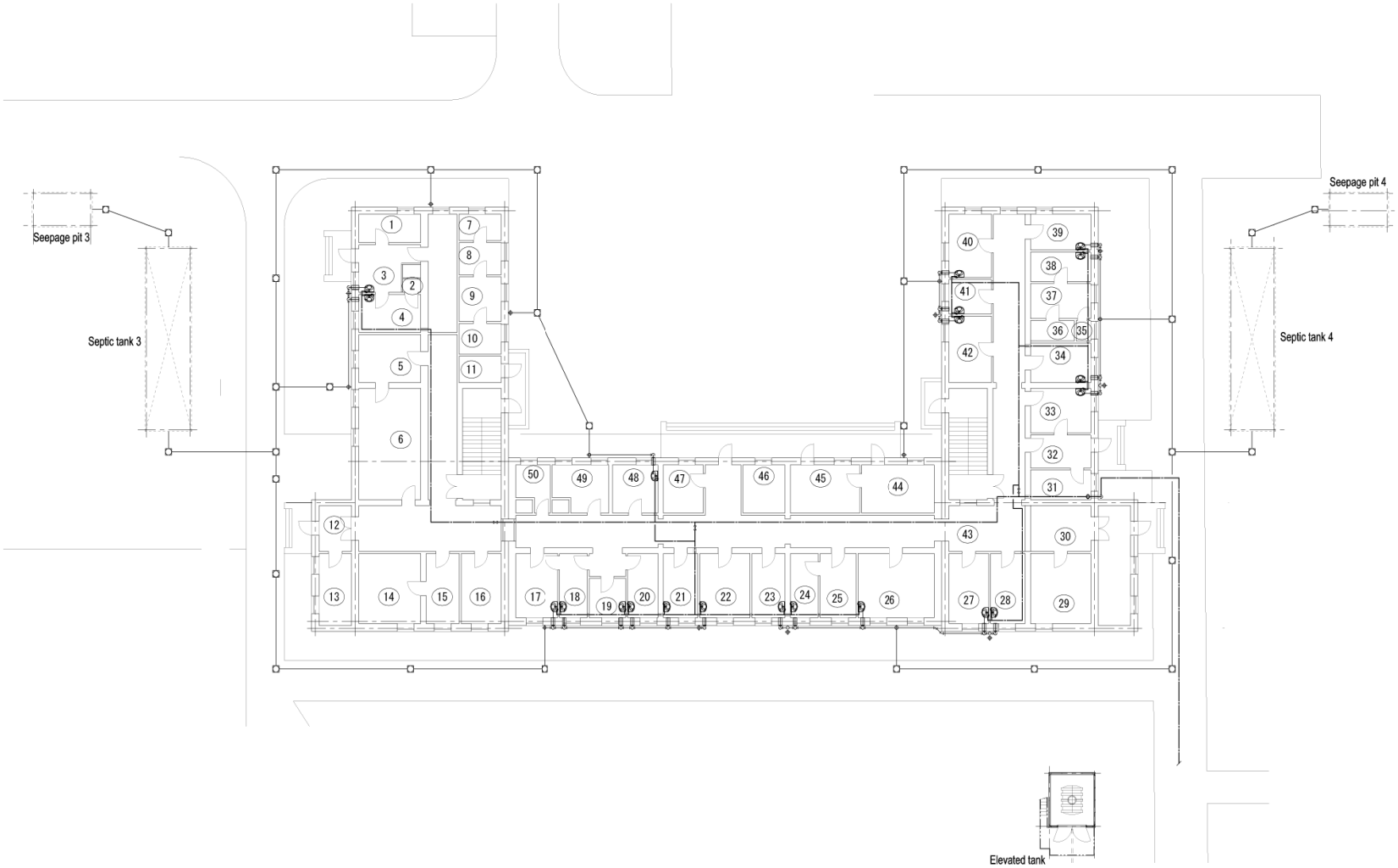


Figure 2.26

Jomi Central District Hospital / renovation
Pediatric Ward 1st Floor Plan / Water supply and drainage plan

0m 3m 6m 9m 12m 15m

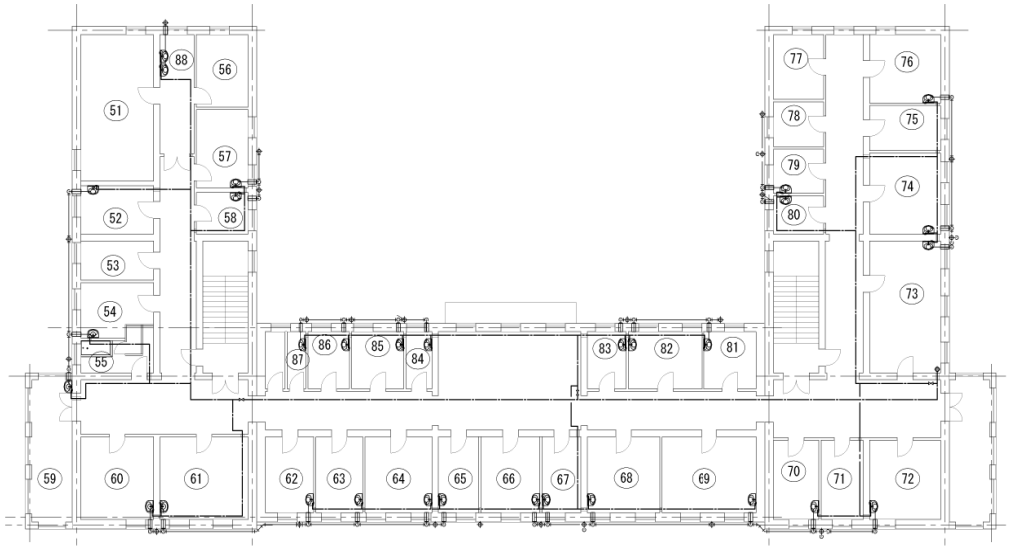
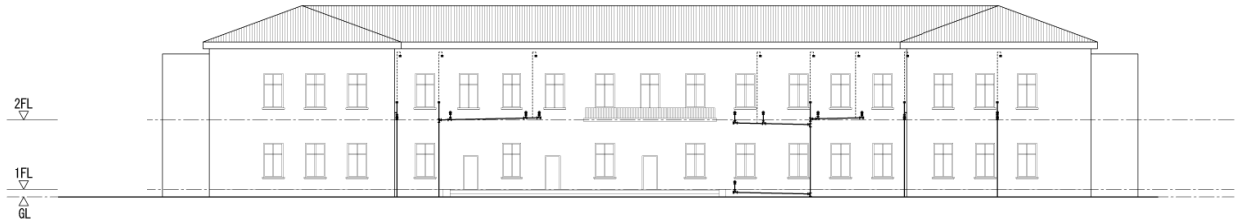


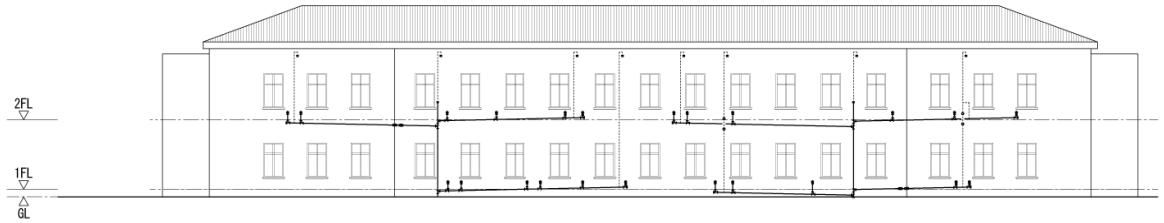
Figure 2.27

Jomi Central District Hospital / renovation
Pediatric Ward 2nd Floor Plan / Water supply and drainage plan

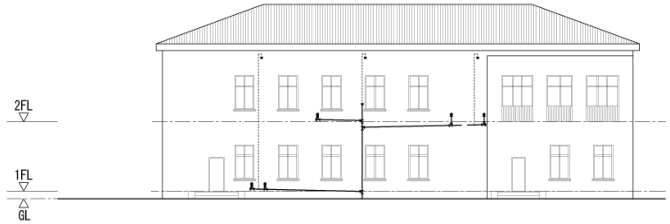
0m 3m 6m 9m 12m 15m



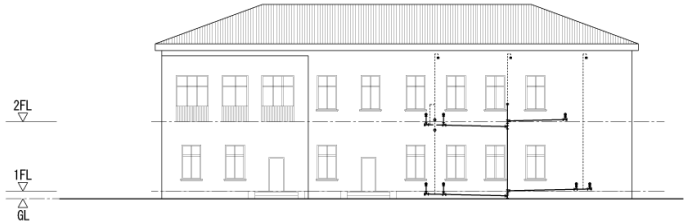
North Elevation



South Elevation



West Elevation



East Elevation

Jomi Central District Hospital / renovation
Pediatric Ward Drainage pipe exterior laying elevation plan

Figure 2.28

0m 3m 6m 9m 12m 15m

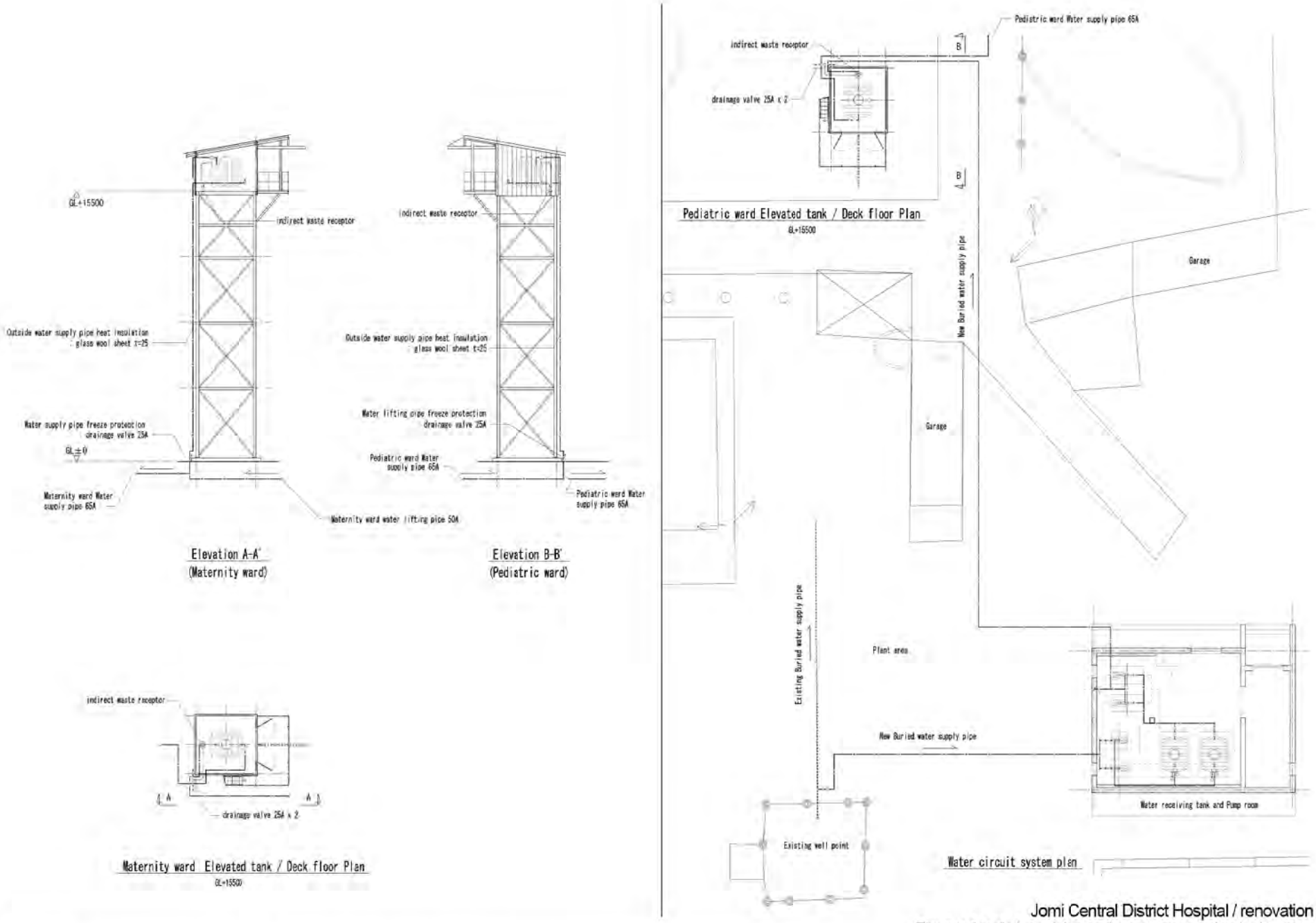
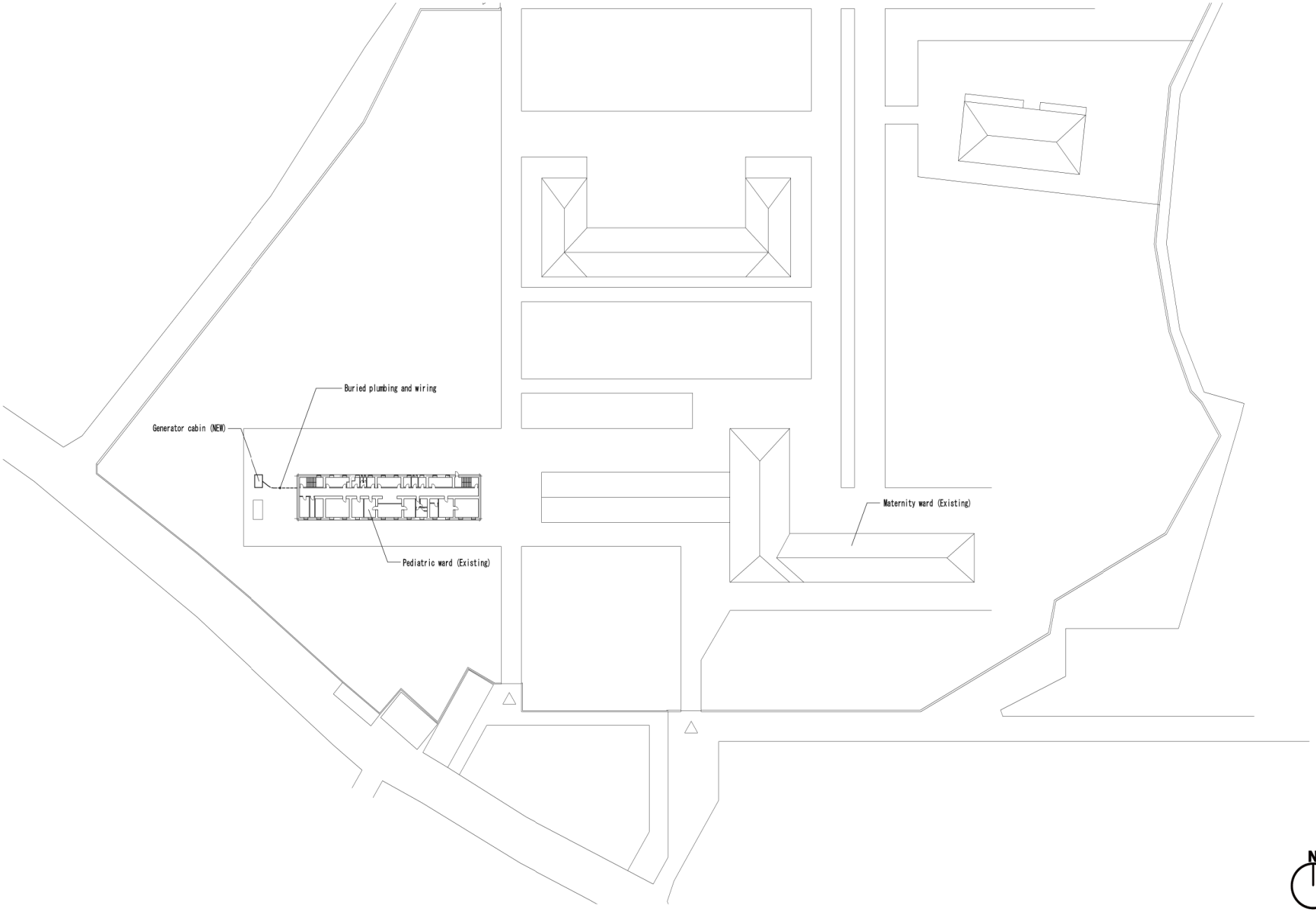

GL+15500
indirect waste receptor
Outside water supply pipe heat insulation : glass wool sheet t=25
Water supply pipe freeze protection drainage valve 25A
GL±0
Maternity ward Water supply pipe 65A
Maternity ward water lifting pipe 50A
Elevation A-A'
(Maternity ward)
indirect waste receptor
Outside water supply pipe heat insulation glass wool sheet t=25
Water lifting pipe freeze protection drainage valve 25A
Pediatric ward Water supply pipe 65A
Pediatric ward Water supply pipe 65A
Elevation B-B'
(Pediatric ward)
indirect waste receptor
drainage valve 25A x 2
Maternity ward Elevated tank / Deck floor Plan
GL+15500
Pediatric ward Water supply pipe 65A
indirect waste receptor
drainage valve 25A x 2
B
B
Pediatric ward Elevated tank / Deck floor Plan
GL+15500
New Buried water supply pipe
Garage
Garage
Existing Buried water supply pipe
Plant area
New Buried water supply pipe
Water receiving tank and Pump room
Existing well point
Water circuit system plan
Jomi Central District Hospital / renovation
Elevated tank / receiving tank pump room pipe laying plan
0m 2m 4m 6m 8m 10m

Figure 2.29

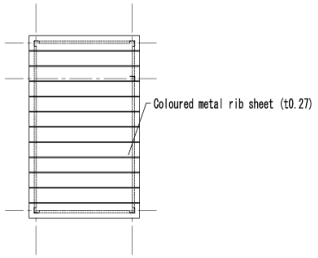


Khatlon Oblast Provincial Hospital Whole Layout Plan

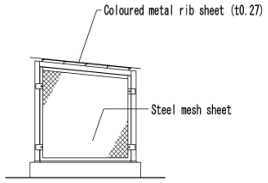
The Project for Improvement of Medical Equipment and
Water Supply and Drainage Facilities for Maternal and Child Health Care Institutions

0 25 50 75 100

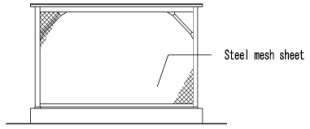
Figure 2.30



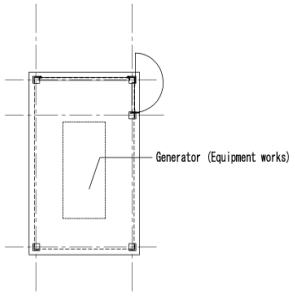
Roof plan



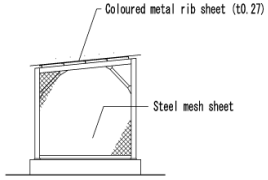
North Elevation



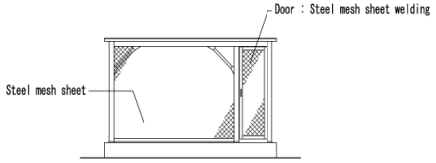
West Elevation



1st.Floor plan



South Elevation

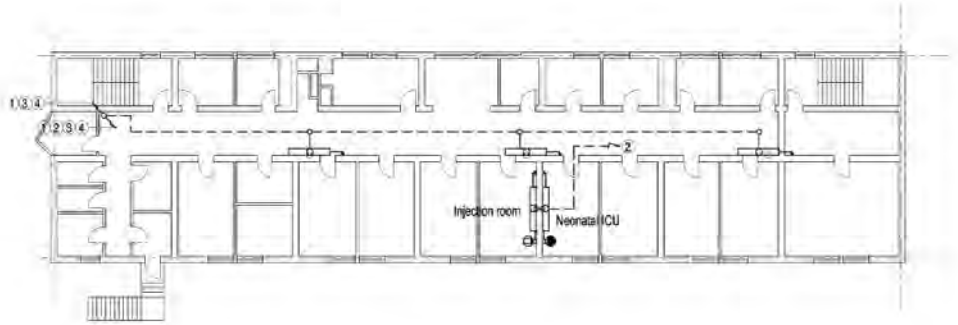


East Elevation

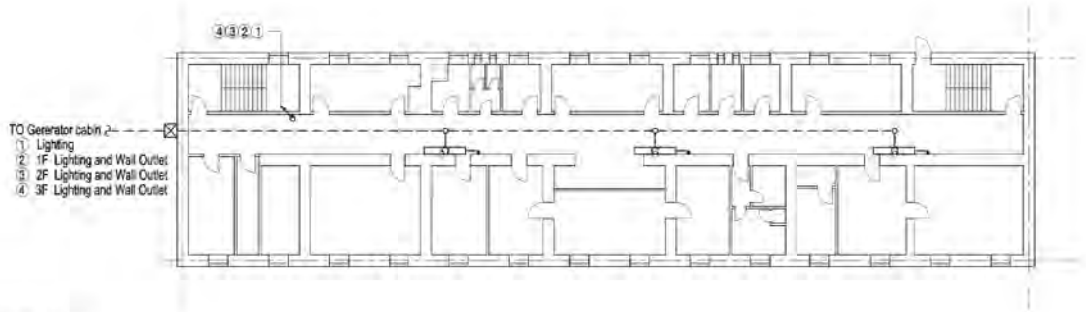
Figure 2.31

Khatlon Oblast Provincial Hospital / New Construction
Power generator room

0m 1m 2m 3m 4m 5m



1St floor plan



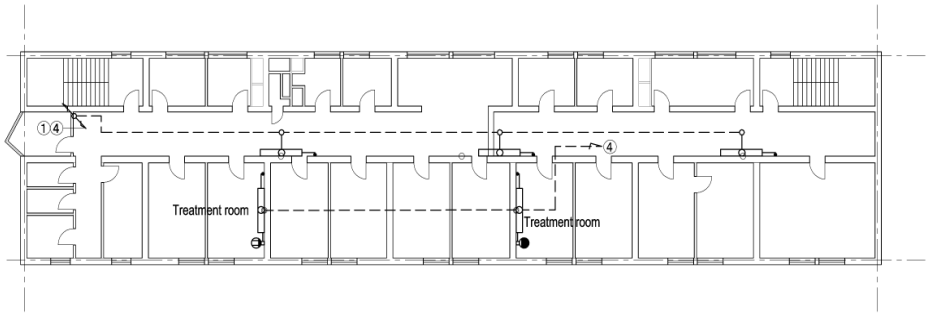
Ground floor plan

Exposed Electrical outlet
Outlet box
Outlet box
Fluorescent light
Powerswitch
Pull box
① ~ ⑤ Circuit number
Piping and Wiring

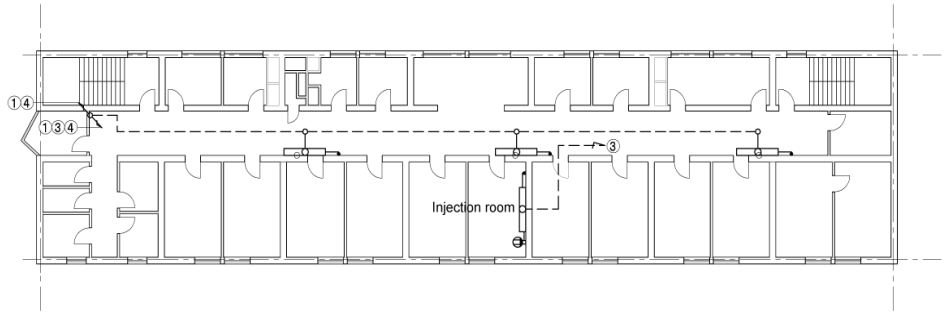
Figure 2.32

Khatlon Oblast Provincial Hospital / renovation
Pediatric Ward Electrical equipments installation plan 1

0m 3m 6m 9m 12m 15m



3rd floor plan



2nd floor plan

Figure 2.33

Khatlon Oblast Provincial Hospital / renovation
Pediatric Ward Electrical equipments installation plan 2

0m 3m 6m 9m 12m 15m

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

Based on this report, related gavernmental agencies of Japan reviewed the contens of this Japan's Assistance Project, and, following the approval of the Japanese Cabinet, the Exchange of Notes (E/N) and Grant Agreement (G/A) will be officially executed by and between the governmetal agencies of Japan and Tajikistan.

In accordance with the framework of Japan's Grant Aid Scheme, a Japanese consultant concludes a Consultancy Agreement with the Government of Tajikistan, and controls over and promotes the plan as a consultant of the Tajikistan side. The Assistance Project consists of the equipment procurement work and the construction works of water supply and drainage facilities. Contractor(s) engaging in these works are selected out of Japanese company(ies) by competitive bidding with restrictions on qualifications to participate. Each of the agreement and contract between the Government of Tajikistan and the consultant and contractors come into effect when JICA, an independent administrative agency, has approved it.

(1) Implementing Agencies

The Ministry of Foreign Affairs in Tajikistan is the responsible agency during the conclusion of the E/N and G/A. The Assistance Project will be implemented under the supervision of the Ministry of Health, and Bureau of the Maternal & Child Health within the Ministry that will take charge of planning, coordination, bidding, etc, concerned to the Project's implementation until completion of the Assistance Project.

(2) Consultant

Following the signing of the E/N and G/A, the Ministry of Health shall conclude an agreement for consulting services with the Japanese consultant firm, with regard to the detail design (including tender and tender-related works) and supervison of the equipment procurements / installation and rehabilitation works on water supply and drainage facilities. Based on the verification by JICA with regard to the said Agreement, the consultant, in consultation with the Ministry of Health, implements the detailed design, summarizes a tender documents, obtaions the approval, conducts the tender, and supervises the procurement and installation works on the equipment, rehabilitation works on water supply and drainage facilities, following to the scope of works under the tender conditions.

(3) Contractor

The contractor to procure and install the equipment and to rehabilite the water supply and drainage facilities for the Assistance Project shall be selected through competitive tendering.

As for the two (2) district hospitals whch are targeting only rehabilitation works on water supply and dranage facilities, the contractor is required to manage the schedule, maintaining the safety and quality which is required by Japan's grant aid projects. The contractor should be able to satisfy the following conditions.

(i) Although construction is small-scale including that of elevated tanks and pump rooms, it includes new construction. Thus, the contractor secures personnel in charge of management of construction work.
(ii) Construction includes plumbing and installation of sanitary fittings and machineries and pumping equipment within the facilities. Thus, the contractor secures personnel in charge of management of work related to electricity equipment and machine (piping, etc.).
(iii) Construction work is conducted on 2 sites, where 3 buildings are subject to repair of equipment. The contractor takes the distance between the sites into account and prepares a number of managers of construction work.
(iv) The contractor has administrative officers in charge of management of procurement of materials and equipment, and payments to subcontractors.
(v) The contractor has a back-up system in Japan to deal with problems occurring on site (a back-up system in Japan by engineers to deal with the construction work).

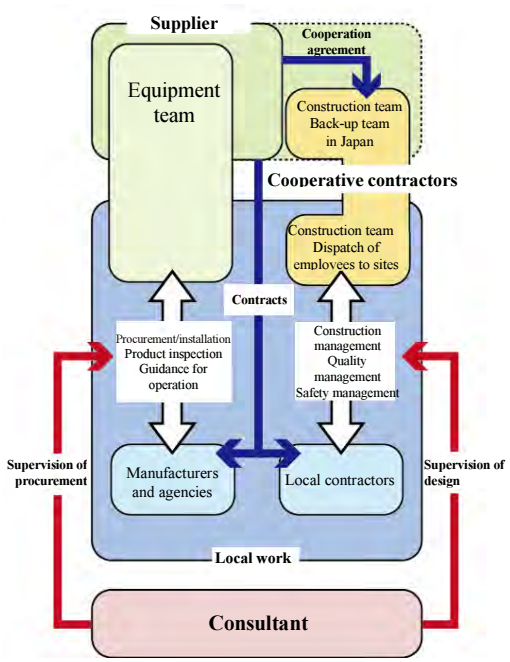
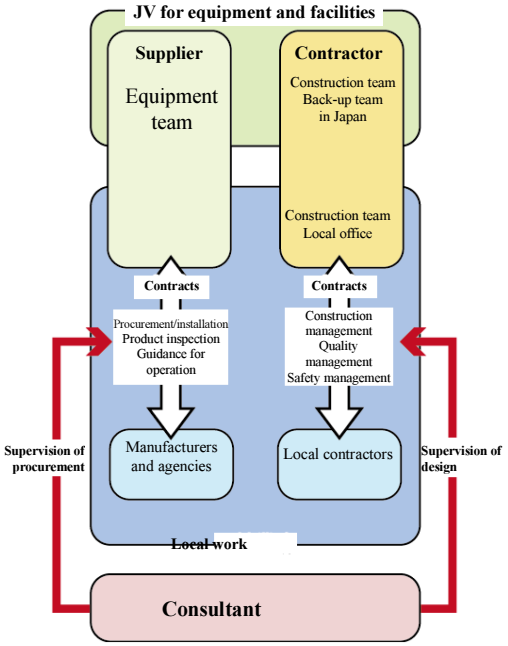
Under the consideration of the above-mentioned characteristics of the Assistance Projecr's components and elements, the following conditions should be considered as eligible bidders for the Project.

Requirements for Participation in Bidding

1. The equipment supplier shall obtain the consent of cooperation with registered contractor as a construction company in Japan with a track record of construction work in abroad, or shall formulate a joint venture (JV) with such contractors.

2. For Project implementation for construction, the supplier and the contractor must have management engineers such as construction management, electric construction management and piping work management, as well as qualified architects of the first class. They must also be able to dispatch and station a number of these employees on sites on a regular basis, and organize, throughout the construction period, a back-up team in Japan comprising personnel of the similar qualifications and experiences.

Table 2.25　Comparison of Bidding Forms

	Case 1: Cooperation and agreement basis (reinforcement)	Case 2: Joint venture
Schematic Diagram		
Comments	This form is close to a joint venture, but business operators to procure equipment solely receive orders after obtaining cooperation and agreements of the contractor and guaranteeing the implementation of the construction work. An expected case is a leading trading company which can have affiliated companies.	Individual specialized business operators are in charge of procurement of equipment and construction of facilities, so the stablest system can be established. The joint venture is responsible for the implementation of the overall project, but each component company is responsible for its own duties.

2-2-4-2 Implementation Conditions

(1) Matters to Consider Concerning Procurement of Medical Equipment

In implementing the Assistance Project, special attention should be paid to the following points:

1) Minimize the Interruption of Medical Practice during Work Period

Because the hospital covered by the Assistance Project need to continue their routine clinical services during the installation period, the period in which the services are interrupted must be minimized. In order to minimize the interruption, the procurement process if the equipment should be strictly supervised, and the installation and inspection schedule should be formulated through discussion in advance and strictly observed with those related to the respective hospitals. In addition, certain measures should be taken to ensure the safety of patients and medical staff at respective hospitals.

2) Transport and Delivery Route

Transport routes should be defined considering the work supervision plan, based on the use of the following routes.

◆ Route 1 (From Japan)

Japan (marine transport) → China (Lianyungang) → Kyrgyzstan → Dushanbe (The transport from

Kyrgyzstan to Dushanbe uses trucks, because the use of railways over the entire route would mean a passage through Uzbekistan.)

* Transport period based on previous information: 70-80 days.

◆ Route 2 (From Europe and Russia)

Europe (land transport; the equipment exported from Europe passes through Russia) → Russia → Kazakhstan → Kyrgyzstan → Dushanbe

* Transport period based on past performance: about 30 days.

(2) Points to Note for Rehabilitation Works on Water Supply and Drainage System

The rehabilitation works in this Assistance Project is classify into outdoor work (construction of elevated tanks and pump rooms, and underground piping work) and indoor work (rehabilitation of the water supply and drainage systems of the facilities). Since both the works are carried out while keeping the existing hospitals in operation, safety and schedule management should be planned.

1) Safety Management

Care and safety measures must be taken for the outdoor work by placing temporary fences to prevent unauthorized entry of hospital staff workers and also paying attention to traffic of construction vehicles on the premises. The indoor work is carried out near wards, consulting room and administrative offices which are all in operation, so that due care and diligence must be taken to secure safe routes for patients and hospital staff workers near the construction sites, build a sufficient safety management system in relation delivery of materials and equipment, and waste materials, and pay due attention to dusts, noise and oscillation which could affect inpatients and other people.

2) Schedule Management

To draw up a schedule for this plan, (i) climate conditions in cold winter and (ii) maintenance of the functions of the hospitals must be taken into account. In cold winter, the minimum temperature drops to minus 20 degrees below zero with deep snow and rain, and thus it is impossible to carry out the outdoor work, in particular civil engineering work. Moreover, any vehicle needs to cross mountains to go to Shartuz Central District Hospital from Kurgan-Tyube, the capital of Khatlon Oblast, so it is difficult to transport materials and equipment due to road surface freezing in cold winter. Thus, no construction work is expected to be conducted in such periods. As for maintenance of the hospital functions, on the other hand, the schedule of the outdoor work has no direct impact on the hospital functions, but the indoor work cannot be carried out in a lump: the facilities are divided into small blocks comprising several rooms so as to proceed with the work for each block at a time. For smooth work, it is essential for the contractor and the hospitals to adjust the schedule and decide the rotation of blocks (that the hospitals cannot use) in advance. It is also necessary to build a close liaison scheme to make fine arrangements of, for example, transfer of inpatients and hospital staff workers in accordance with the progress of the construction work.

To discuss these matters and promote smooth and uninterrupted construction work, responsible officers of the Ministry of Health, persons concerned with the hospitals, the contractor and the consultant

hold monthly meetings, report on the schedule, safety, quality and other matters, closely consult with one another, and thoroughly take necessary steps.

3) Allocation of Engineers of the Contractor

To complete the facilities agreeing with the design documents within schedule, the Japanese business operators are required to maintain congenial cooperative and supportive relations with local contractors, appropriately provide technical guidance and manage the schedule, quality and safety. A Japanese head, construction engineer, plant engineers and administrator are stationed on a permanent basis for appropriate guidance and sufficient coordination with the organizations concerned. While one plant engineer is stationed during the period of the outdoor work, two plant engineers - one each for the central district hospitals - are stationed during the period of the indoor work, which requires fine coordination in accordance with the progress of the work. The types, number and scope of duties of Japanese permanently present engineers are shown in the following table, while a proposed local organizational system is shown in Figure 2.26.

Table 2.26 Type and Number of Permanently Present Engineers of Japanese Corporations

Classification	No. of personnel	Scope of duties
Head	1 person	Overall management and construction management of Jomi Central District Hospital
Construction engineer	1 person	Construction guidance, schedule and quality management, guidance for construction drawings, and construction management of Shartuz Central District Hospital
Plant engineers	2 persons	One each for system construction, quality management and technical guidance of Jomi and Shartuz Central District Hospitals
Administrator	1 person	Administration, personnel management and procurement management

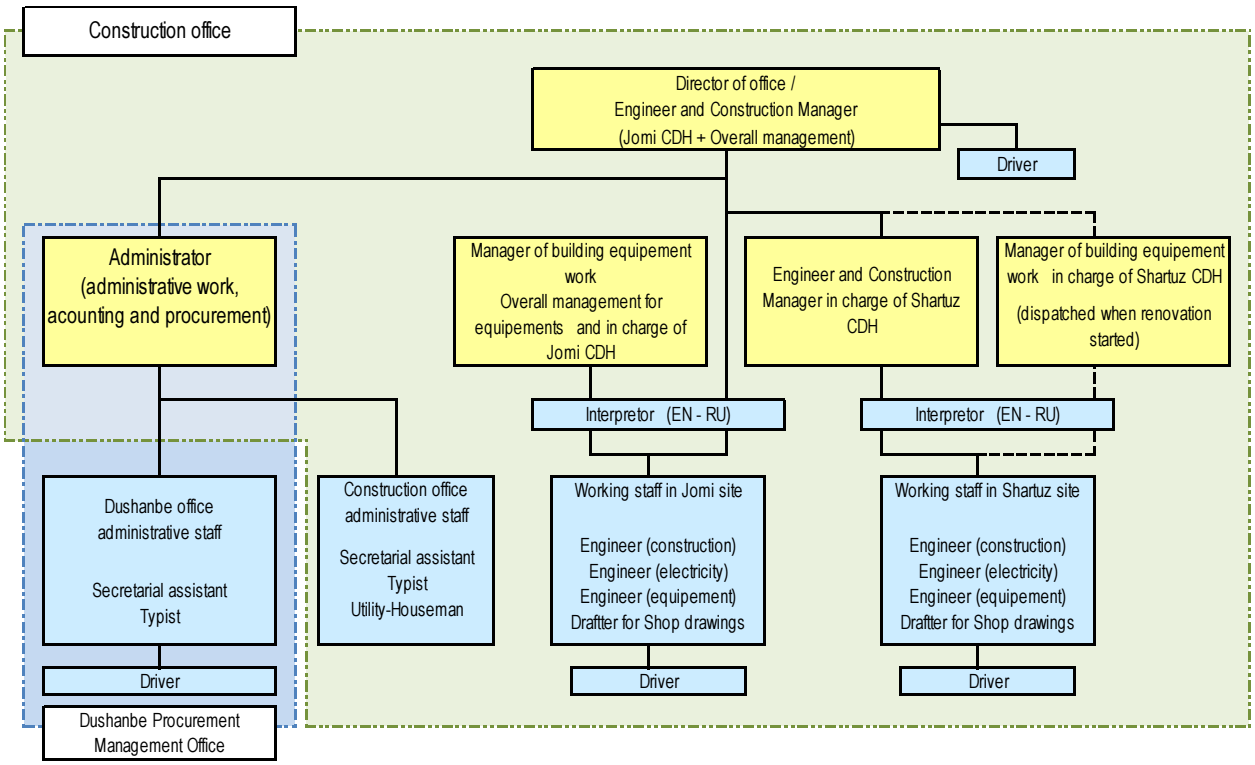


Figure 2.34 Proposed Local Organizational System

2-2-4-3 Scope of Works

The works in the responsibilities of Japan and those in the responsibilities of Tajikistan are as follows:

(1) Division of Responsibilities in Procurement and Installation (Procurement of Medical Equipment)

The cooperation project is implemented through cooperation between the governments of Japan and Tajikistan according to the grant aid scheme. The responsibilities of each of these countries are as follows.

1) Responsibilities Covered by Grant Aid from the Government of Japan

- Cost of the procurement of planned equipment
- Cost of marine transport and inland transport to the target medical facilities in Tajikistan
- Cost of the installation and placing of equipment
- Cost of test runs and technical instruction in operation and maintenance checkups concerning all procured equipment.

2) Responsibilities of the Government of Tajikistan

- Disclosure of information and documents needed for installation and placement
- Removal of old equipment in the places planned for the installation of new equipment and preparation of the rooms after removal
- Provision of facility infrastructures (electricity, radiation shielding, etc.) for the places for the installation of new equipment

- Provision of places for the unloading of procured equipment
- Provision of places for the storage of equipment until installation
- Provision of the routes for carrying procured equipment to the places for installation

(2) Classifications of Construction (Water supply and Drainage)

The division of work to be carried out by the Japanese side and the Tajikistan side is shown in table 2.27.

Table 2.27 Classification of Construction

	Hospital	Work to be done by the Japanese side	Work to be done by the Tajikistan side
Site	Common	・ None	・ Clearance of trees interfering with construction of facilities ・ Ground leveling prior to commencement of construction
Exterior work	Jomi	・ Underground pipes from receiving water tank pump room to elevated tank ・ Septic tank	・ None
	Shartuz	・ Underground pipes from pump room to elevated tank	・ None
Facility construction	Jomi	・ Elevated tank and receiving water tank pump room ・ Repair of system in obstetric ward and pediatric ward	・ None
	Shartuz	・ Elevated tank and pump room ・ Repair of system in obstetric ward and pediatric ward	・ None
	Khatlon	・ Power generation room ・ Electricity equipment work at pediatric ward	・ None
Electricity	Jomi	・ Installation of electric pole and electricity supply to receiving tank pump room	・ None
	Shartuz	・ Bifurcation of electricity from distribution board at existing pump room	・ None
Water supply	Jomi	・ Water supply pipes from well to individual rooms	・ None
	Shartuz	・ Water supply pipes from city water to individual rooms	・ None
Drainage	Jomi	・ Drainage pipes from sanitary fittings to septic tank	・ None
	Shartuz	・ Drainage pipes from sanitary fittings to drainage cranes	・ None

2-2-4-4 Consultant Supervision

(1) Procurement Supervision Plan (Procurement of Medical Equipment)

Based on the Japanese grant aid scheme, the Japanese consultant shall conclude the agreement for consulting services with the Ministry of Health, according to which the consultant will render detailed design (including tender-related works) and perform procurement supervisory services. The purpose of consultant supervision is to make certain that the equipment supplier selected through public tender is properly carrying out its assigned obligations according to the contract, concluded with the Ministry of Health and to give guidance and make necessary adjustments from an objective viewpoint to ensure proper

execution. The supervisory work consists of the following services.

1) Assistance with Tender Procedures and Contracting

To select a Japanese trading company to take charge of the equipment procurement / installation, the consultant will prepare tender documents, announce the tender publicly, distribute the tender documents to bidders, accept and evaluate tenders offered, and give advice with regard to the contract to be concluded between the Ministry of Health and the selected supplier.

2) Guidance, Advice, and Coordination for Equipment Supplier

The consultant shall examine the procurement / installation plan and give instructions and advice to the supplier to make certain adjustments if necessary.

3) Inspection and Approval of Relevant Documents

The consultant shall examine the equipment procurement / installation schedule and its management structure by staff concerned, technical documents related to the equipment, and other necessary documents to be submitted from the supplier, give advice as necessary, and approve the documents.

4) Report on the Progress of Work

The consultant shall monitor the progress of actual work against the proposed plan, and report to the related parties in Japan and Tajikistan.

5) Inspection and Testing upon Completion

Upon completion of the work, the consultant shall attend the on site inspection and test-run of the equipment in order to confirm that the equipment is consistent with provisions of the contract. Final report will be submitted to authorities concerned on the Tajikistan side.

(2) Supervision Plan for Water Supply and Drainage Work

Supervisory works on rehabilitation of water supply and drainage system commences at the time JICA approved the contract on equipment supply and rehabilitation work on water supply and drainage system. The works in regard to the rehabilitation of water supply and drainage system is roughly divided into construction work and machinery system work, so that supervisors of different specialties are dispatched in accordance with the progress of the work. After conclusion of the said contract, staff workers in charge of construction are dispatched to Tajikistan to confirm the entire schedule with the Ministry of Health, hospital staff workers and contractors, draw up a rotation plan at the existing hospitals and build a liaison system. At the time the outdoor work for elevated tanks commences, Structural (or Architectural) engineer will be dispatched to supervise the construction work, where as those Mechanical Equipment engineer will be dispatched at the time indoor repair work for the water supply and drainage system commences at the existing hospitals. And those architectural engineers will be dispatched at the time the construction work is to be completed. Figure 2.35 outlines the process of construction work and dispatches of supervisors, and Figure 2.36 shows a schematic diagram of the overall supervisory system.

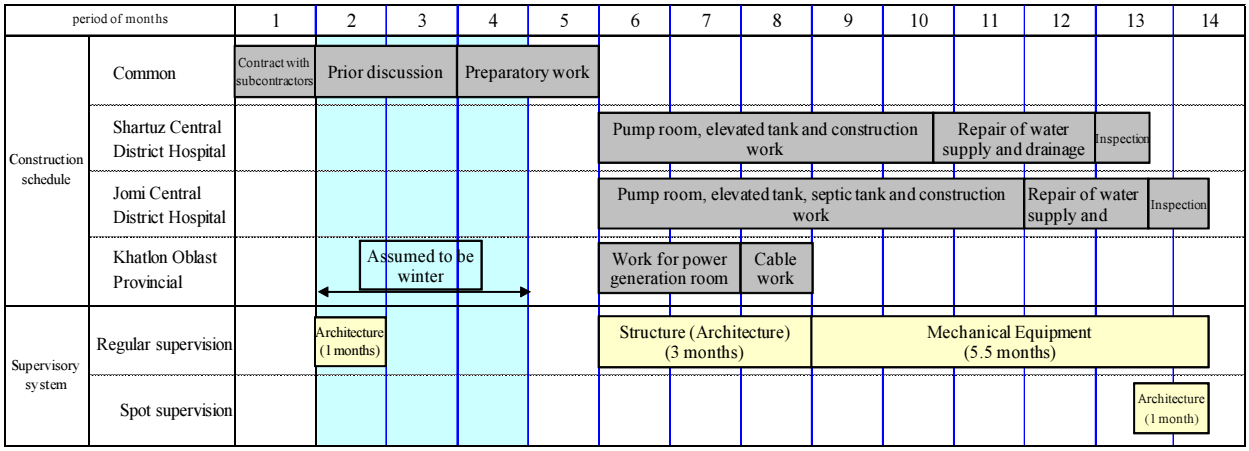


Figure 2.35 Schedule of Supervision by the Consultant

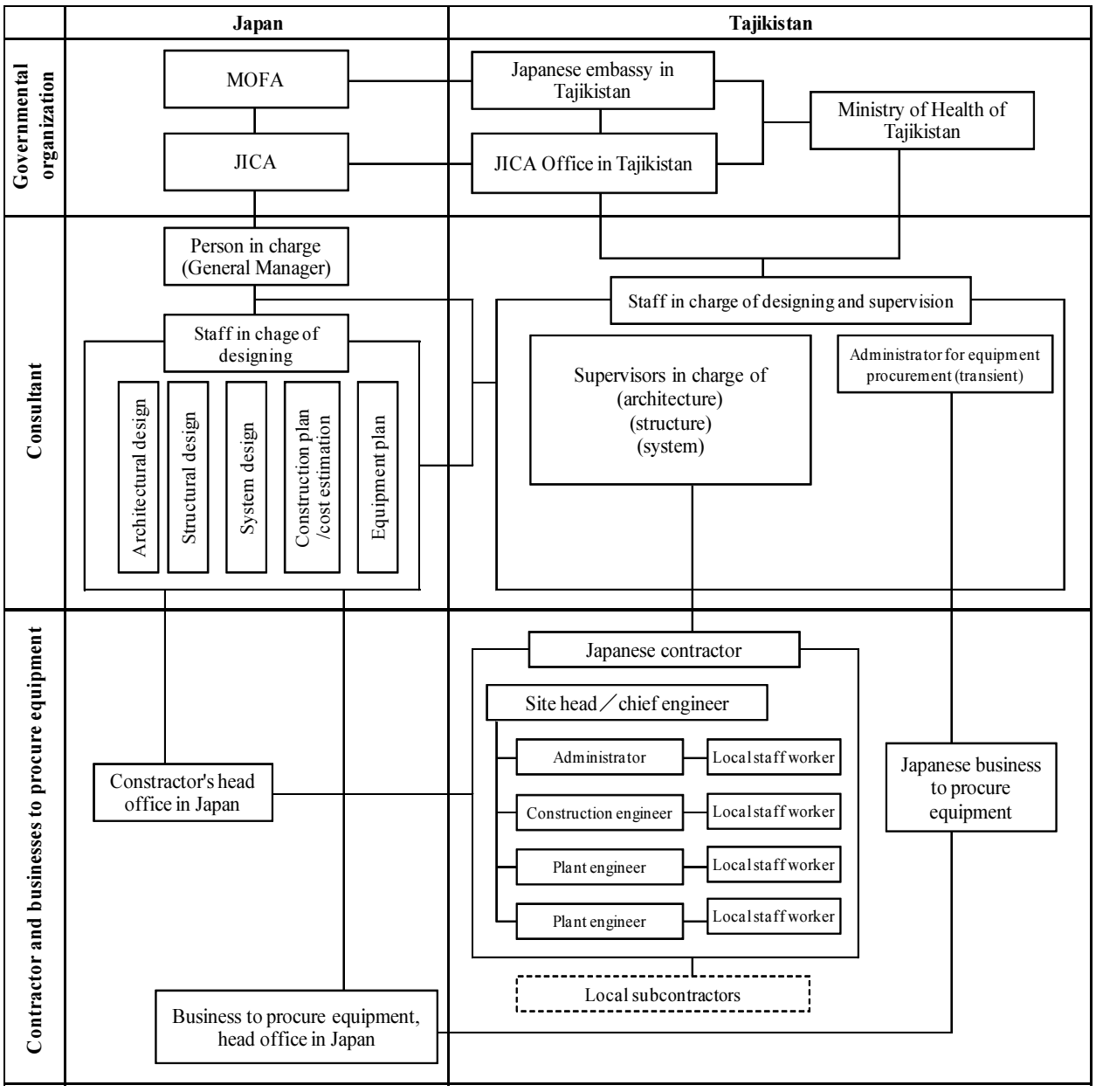


Figure 2.36 Supervisory Structure

2-2-4-5 Quality Control Plan

Table 2.28 lists items for quality management in this plan. The point of quality management for framework construction in Tajikistan where earthquakes frequently occur is to confirm the strength of base materials and welding for structural steel, and to control and confirm the concrete strength taking into account the temperature of placement and the strength of base materials of reinforcing bars. Strength tests are outsourced to a test organization in Dushanbe since no such organization to test the strength of concrete, reinforcing bars and structural steel exists in Kurgan-Tyube, the city near the sites.

Table 2.28 Quality Management Plan

Work	Type of work	Management item	Confirmation method
Framework construction	Foundation work	Bearing layer	Confirmation of bearing layer
	Concrete work	Fresh concrete	Test mixing, slump test, air volume, temperature and chloride quantity
		Concrete strength test	Compressive strength test
	Reinforcement work	Strength of reinforcing bar	Inspection certificates and ultimate tensile strength test
		Bar arrangement	Bar arrangement inspection (measurements and location)
	Steel frame-work	Strength of steel frame	Inspection certificates and ultimate tensile strength test
		Welded parts (fillet welding) *1	Visual inspection
Finishing work	Roofing	Results and leakage	Spray test
	Plastering	Results	Visual inspection
	Joinery work	Products	Confirmation of appearance and measurements
		Accuracy of installation	Confirmation of appearance and measurements
	Painting	Results	Visual inspection
	Interior finishing	Results	Visual inspection
Electricity work	Piping work	Bending and intervals of supports	Confirmation of appearance and measurements
	Electric wire and cable work	Damage to sheath	Confirmation of performance records and cleaning prior to laying work
		Looseness of connected parts	Marking after retightening bolts
	Lighting work	Performance, operation and installation	Confirmation of performance records, illumination test and appearances
Machinery system work	Water supply plumbing	Intervals of supports and leakage	Appearance, leakage and water pressure tests
	Drainage plumbing	Slopes, intervals of supports and leakage	Appearance, leakage and water conduction tests
	Sanitary fitting installation	Operation, installation and leakage	Appearance and water conduction tests

2-2-4-6 Procurement Plan

(1) Country of Origin of the Planned Equipment

Although a majority of the equipment can be procured from Japanese manufacturers, it is necessary to expand the range of eligible source countries in order to secure the presence of manufacturers' agent or authorized representative with servicing capabilities and ensures fair competitive situation in the bidding process. Procurement from European countries and the United States, in addition to Japan and Tajikistan, should be considered for the items such as Anesthesia apparatus (with Ventilator), Electrosurgical unit,

Defibrillator, Patient monitor, Neonatal monitor, Ventilators (for Adults and for Infants), Ultrasound scanner, Pulse oxymeter, Cardiotocograph, Vacuum extractor, Oxygen concentrator, Nebulizer, Autoclave, Hot air sterilizer, Infusion pump, Syringe pump, Infant warmer and Infant incubator. Because there are no manufacturers of medical equipment in Tajikistan, eligible source countries should be expanded to include EU countries or DAC member countries, in addition to the United States, and the locations of manufacturers' agencies should be expanded to include those in neighboring countries such as Russia, Kazakhstan, and Kyrgyzstan in order to warrant availability of servicing while ensuring competition principles in bidding.

(2) Materials and Equipment related to the Rehabilitation of Water Supply and Drainage System

Materials to be used for construction in this cooperation plan are in principle procured locally. As for imported structural steel and reinforcing bars, there are some concerns about the supply capacity of local cities in Khatlon Oblast where the cooperation plan is put into execution. Moreover, these items are sold in small lots and thus it is impossible to procure products with inspection certificates. Thus, construction materials and equipment are procured in advance in Dushanbe and stored at construction sites. The procurement plan for major construction materials and equipment is shown in Table 2.29.

Table 2.29 Procurement Plan for Major Construction Materials and Equipment

Type of work	Material name	Procurement in			Remarks
		Local	Japan	3rd countries	
Reinforced concrete work	Sand	○			River sand collected nearby is available. Both the quantity and quality are satisfactory.
	Gravel	○			Available at neighboring stone pits. Both the quantity and quality are satisfactory.
	Cement	○			Domestic products are available but their quality is questionable. Imported cement is procured. Both the quantity and quality are satisfactory.
	Reinforcing bar	○			Imported goods from Russia, etc. are locally procured.
	Materials for mold	○			Locally procured timber is used.
Steel frame work	Steel shapes	○			Imported goods from Russia, etc. are locally procured.
	Nuts and bolts	○			Imported goods from Russia, etc. are locally procured.
Masonry work	Brick	○			Bricks are produced domestically.
Water proofing	Mineral surfaced roofing	○			Imported goods from Russia, etc. are locally procured.
Roofing	Colored metal rib sheet	○			Imported goods from Russia, etc. are locally procured.
Plastering	Cement mortar	○			Local products are procured.
Joinery work	Steel fitting	○			Fittings are produced on site with imported materials.
Painting	Paint	○			Local products are procured.
Machinery system work	Piping material	○			Local procurement for easier maintenance.
	Pump	○			Local procurement for easier maintenance.
	Valves	○			Local procurement for easier maintenance.
	Sanitary fitting	○			Local procurement for easier maintenance.

Type of work	Material name	Procurement in			Remarks
		Local	Japan	3rd countries	
Electricity system work	Boards	○			Local products are procured.
	Lighting equipment	○			Local procurement for easier maintenance.
	Piping material	○			Local procurement for easier maintenance.
	Electric wire	○			Local procurement for easier maintenance.
	Cables	○			Local procurement for easier maintenance.
	Wiring equipment	○			Local procurement for easier maintenance.

2-2-4-7 Operational Guidance Plan

The equipment to be procured in this Assistance Project requires basic operation and maintenance skills. It will be necessary to train the clinical staff in operation and troubleshooting of the equipment during the period of installation, adjustment, and test running. The consultant will give the necessary instructions of the training program implemented by the equipment supplier.

Such equipment include Anesthesia apparatus (with Ventilator), Electrosurgical unit, Patient monitor, Ventilator (Adult and Infant), Ultrasound scanner, Fetal doppler, Cardiotocograph, Oxygen concentrator, Infant incubator and Infant warmer, etc., many of which are electronically controlled.

2-2-4-8 Soft Component (Technical Assistance) Plan

(1) Background for the Provision of the Soft Component

Regarding the maintenance of medical equipment in Tajikistan, good practice is performed to the extent that equipment is cleaned properly after use by users and cleaning personnel, but hospitals ranging from the nationally operated Diakov Hospital to number hospitals on the district level are not staffed with engineers with the knowledge of electricity and electronics. During the era of the former USSR, there was a national enterprise that centrally responded to equipment troubles and performed repair, and this fact seems to have lingering repercussions in the present practice. There seem to be no hospitals employing maintenance engineers on their own to take charge of the maintenance of medical equipment. Although several private companies have been doing business in the sale of medical equipment and after-sales services since about 2000, the number of such companies is still small.

Repair services after the expiration of warranties are chargeable, and this expenditure deals heavy blows to hospitals. Therefore, considering the fact that hospitals do not have their own engineers, much emphasis should be placed on preventive measures, the actions to keep machine troubles from occurring. It is desirable to practice simple periodical servicing, starting from a check of external appearance of equipment before and after use performed by users or cleaning personnel. Helping the practice of simple user servicing to take root is a very important and meaningful step to building the foundation for the maintenance of medical equipment of Tajikistan. The provision of soft component by Japanese engineers to support the continued use of the grant aid medical equipment with appropriate maintenance of accuracy is considered sufficiently worthwhile.

(2) Goal of Soft Component

The equipment procured through the Assistance Project is maintained and managed appropriately at

target hospital.

(3) Methods to Confirm Outcome Achievement

Table 2.30 shows the methods to confirm outcome achievement.

Table 2.30 Methods to Confirm Outcome Achievement

Soft Component Summary	
≪Goal≫ The equipment procured through this project is maintained and managed appropriately.	≪Method of Confirmation≫ Confirm that make out the maintenance checkup manual and equipment management logbook through the activities.
≪Outcome≫ 1) The person in charge of equipment management is clearly defined. 1: Everyone knows who the person in charge of equipment management is. 2: Everyone can know who substitutes for the person in charge of equipment management when he is absent. 2) A system to practice preventive maintenance checkup of each equipment and the systematic flow of information concerning each equipment are established. 1: It becomes easier to perform checkups. 2: The places and frequency of checkups are clearly defined. 3: The person in charge of checkups is clearly defined. 4: Everyone can know who substitutes for the person in charge of checkups when he is absent. 5: Information concerning equipment is shared between medical workers and maintenance engineers. 3) A Management logbook for each equipment is maintained. 1: Equipment management logbooks are maintained so that one can quickly know who used which equipment when and how. 2: Equipment management logbooks are maintained so that one can quickly know what trouble occurred in which equipment when. 4) The cost needed for maintenance checkups is identified and the process of budget application is sorted out. 1: A budget application form is completed and the procedures for budget application for the next fiscal year are carried out appropriately.	≪Method of Confirmation≫ Confirm that all staff members can write the name of the person in charge of equipment management (carry out before the completion of activities). Confirm that the person in charge of checkups has been made clear, checkup manuals have been prepared, and the systematic flow of information has been established (carry out before the completion of activities). Confirm that management logbooks are maintained so that everyone can quickly know the condition of equipment (carry out before the completion of activities). It is confirmed that a budget application form has been completed and application procedures are followed strictly (carry out before the completion of activities).

(4) Soft Component Activities (Input Plan)

Activities of soft component will be carried out to heads of facilities, responsible persons from facility management departments, representatives of major clinical departments (physicians, nurses, midwifes) and maintenance managers of facilities and medical equipment to maintain and manage the equipment procured through this Project at each hospital. 15 persons from the Maternity Hospital No.3, 15 persons from Khatlon Oblast Provincial Hospital and 10 persons from 5 number hospitals (2 persons from each number hospital) will participate in these activities. The first dispatch program will be carried out after signing of the suppliercontract by and between the Ministry of Health and equipment supplier. And the second dispatch program will be carried out after two months of hand over. These activities will be taken place at Maternity Hospital No.3 or Khatlon Oblast Provincial Hospital.

1) Workshop (First Stage Program)

When the workshop is held, activities should be developed using the participatory approach with prior preparation in order to elicit the ownership of the counterpart (relevant hospital personnel). Heads of facilities, responsible persons from facility management departments, representatives of major clinical departments (physicians, nurses, midwifes) and maintenance managers of facilities and medical equipment, etc. are encouraged to participate in the workshop (15 persons from the Maternity Hospital No.3, 15 from Khatlon Oblast Provincial Hospital, and 10 from 5 number hospitals). Hospital personnel take leadership in the workshop, and are widely asked to express opinions concerning the present state (problems) of medical equipment maintenance and management. The activities should be guided so that hospital personnel from different departments and specialties express “the problems of medical equipment maintenance and management” they recognize in their positions, and all hospital personnel, from the heads of facilities down, share these problems under one roof. The consultant analyzes the needed “actions (activities)” and “input that should be given” in order to obtain the prescriptions for improving the identified “problems” (outcome). Based on this outcome, the consultant defines the measures for organizational improvement in equipment maintenance and management.

Table 2.31 PDM Used in Workshop (Draft)

≪Project summary≫	≪Index of achievement≫	≪External condition≫
≪Overarching goal≫ Fewer occasions in which daily medical practice is impeded by the unavailability of medical equipment.		Accidents caused by human neglect do not occur (natural disasters are unavoidable). (The practice of safety management does not change.)
≪Goal≫ The equipment provided through the cooperation project is maintained and managed appropriately.	≪Index of goal achievement≫ Changes in the actions after equipment failures	Repair parts become unavailable. (Situation of information collection concerning equipment manufacturers does not change.)
≪Outcome≫ 1） The person in charge of equipment management is clearly defined. 1： Everyone can know who is the person	≪Index of outcome achievement≫ Identification of the person in charge of equipment management	The person in charge of equipment management (including substitute) and the person in charge of checkups

in charge of equipment management. 2： Everyone can know who substitutes for the person in charge of equipment management when he is absent. 2） A system for preventive maintenance checkup of each equipment and the systematic flow of information concerning each equipment are established. 1: It becomes easier to perform checkups. 2: The places and frequency of checkups are clearly defined. 3: The person in charge of checkups is clearly defined. 4: Everyone can know who substitutes for the person in charge of checkups when he is absent. 5: Information concerning equipment is shared between medical workers and maintenance engineers. 3 ） Management logbooks for each equipment is maintained. 1: Equipment management logbooks are maintained so that one can quickly know who used which equipment when and how. 2: Equipment management logbooks are maintained so that one can quickly know what trouble occurred in which equipment when.	Identification of substitute for the person in charge of equipment management Preventive maintenance checkup manual Identification of the person in charge of checkups Identification of substitute for the person in charge of checkups Diagram of information flow system with and outside the facility Equipment management logbook	(including substitute) do not be absent at the same time. (The recognition of teamwork does not change.)
≪Activity to obtain outcome and its index≫ * Derived from the workshop		≪ Matters/input provided by the facility≫ * Derived from the workshop

2) Seminars (Second Stage Program)

Based on the outline determined after the workshop, the second dispatch program offers a seminar, in which the draft versions of the equipment maintenance checkup manual and management logbook prepared in the first dispatch program are presented and explanation is given concerning the content of these materials and the method of use. Opinions and proposals (such as amendment) concerning these documents are heard from relevant hospital personnel, necessary addition and amendment to the drafts are made, and the final versions are prepared. In addition, demonstration by the consultant and return-demonstration by the participants concerning the maintenance using equipment will be applied in this seminar.

It is important to ensure that all medical workers in each hospital understand the fact that they are working in this system and irresponsible absenteeism and laziness substantially lower the effectiveness of the system as a whole. Therefore, the emphasis in the seminar is placed on developing a system that can be operated reasonably by all members and ensuring all members understand how to work in this system. The achievement is reflected in the content of the final deliverables.

3) Personnel Plan

Two engineers are assigned. The first engineer takes charge of works concerning the development of the medical equipment maintenance system. The second engineer produces the preventive maintenance checkup manuals for the 18 items[2] that are considered important among the planned medical equipment and practices maintenance checkup activities aiming at the widespread consistent use of these manuals through the seminar.

- **Engineer 1:** Guiding the development of medical equipment maintenance system (1 person)

During the first dispatch, Engineer 1 takes charge of organizing and holding the workshop and sorting out the elements obtained from the workshop. On the stage of second dispatch, Engineer 1 takes charge of organizing and holding the seminar and providing guidance related to the introduction and operation of the new system for medical equipment maintenance.

As a concrete example, the cycle flow involving the elements 2 through 5 as shown in the Figure below is explained. Focusing on the PPM performed by users, the second dispatch program aims to cerate "an environment in which equipment failures are less likely to occur."

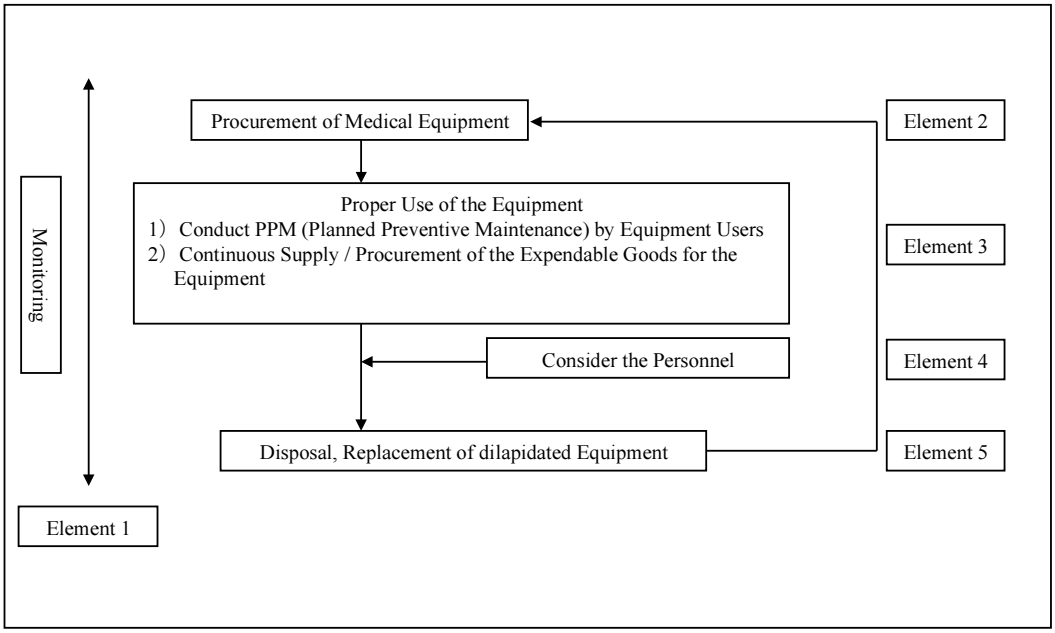


Figure 2.37 Elements and Flow Related to Medical Equipment Operation & Management

- **Engineer 2**: Preparing medical equipment maintenance instructions and providing guidance (1 person)

On the first stage, Engineer 2 assists in the organization and holding of the seminar and prepares the draft versions of the preventive maintenance manuals for the procured medical equipment. During the second stage, Engineer 2 organizes and holds the seminar and performs the demonstration of the preventive

[2] Anesthesia Apparatus, Electrosurgical Unit, Patient Monitor, Neonatal Monitor, Ventilator, Ultrasound Scanner, Fetal Doppler, Vacuum Extractor, Cardiotocograph, Oxygen Concentrator, Nebulizer, Autoclave, Hot Air Sterilizer, Infusion Pump, Syringe Pump, Infant Incubator, Infant Warmer, and Spectrophotometer.

maintenance checkup of the selected equipment. In order to ensure the appropriate use of these manuals at each hospital, Engineer 1 practices the introduction of the rules and mechanisms for the centralized management systems on several types of mannauls concerned, and ensure the responsible person in-charge in the respective hospitals.

(5) Implementation Processes (Manpower, Form, Timing, Duration, etc. of Each Work / Term)

The number of engineers should be two (2). According to the local work practice, the amount of work should basically be 8 hours a day, 5 days a week. The first stage program is conducted after the selection of the equipment supplier and the second stage program is conducted after the completion of the installation of procured equipment. The duration of each of these programs (first dispatch and second dispatch) is planned to be about three (3) weeks each. Because it is important to have the counterpart (relevant hospital personnel who take lead in this activity) develop an awareness of problems and appropriately understand and recognize the importance maintenance of medical equipment, the work in the recipient country is conducted in 2 phases.

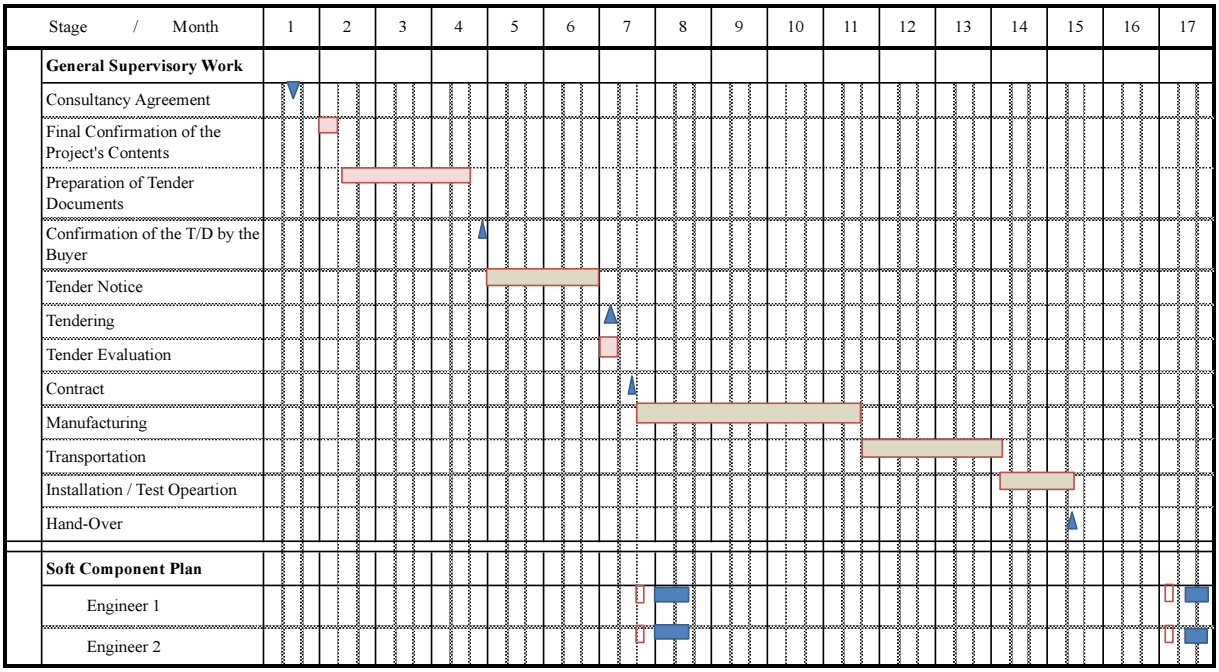


Figure 2.38 Soft Component Implementation Schedule

(6) Outputs from the Soft Component Activities

1) First Stage Program

- Workshop report (report concerning the names of participants, all “elements” obtained in the workshop, and the details of the process leading to this achievement)
- Report on the requests and proposals concerning the organizational improvement of equipment maintenance (report concerning the matters decided in the workshop and the outline produced)
- Preventive maintenance checkup manuals for medical equipment reflecting the opinions of on-site workers (draft). These are prepared for selected items of medical equipment.

2) Second Stage Program

- Preventive maintenance checkup manuals (final) and system description documents describing the definition of checkup personnel, the flow of objects and information within the hospital (flow chart), rules, etc.
- Management logbooks (forms for recording information from daily and periodical inspections and logbooks for the consolidation of this information)

(7) Responsibility of the Executing Agency in the Recipient Country

The expenditures concerning relevant personnel expected to arise from the workshop, seminar, etc. held at each facility are covered by the Tajikistan side.

2-2-4-9 Implementation Schedule

This cooperation plan comprises the detail designing and bidding work undertaken by the consultant, the construction and procurement work undertaken by the contractor, and the supervisory work, again, by the consultant. It is implemented as a single fiscal-year project in consideration of its size, schedule and other factors. The implementation schedule after conclusion of the E/N and G/A between the governments of the two countries is shown in Figure 2.39. Taking cold winter (3 months) into account, the term of construction and procurement is set for 13.5 months.

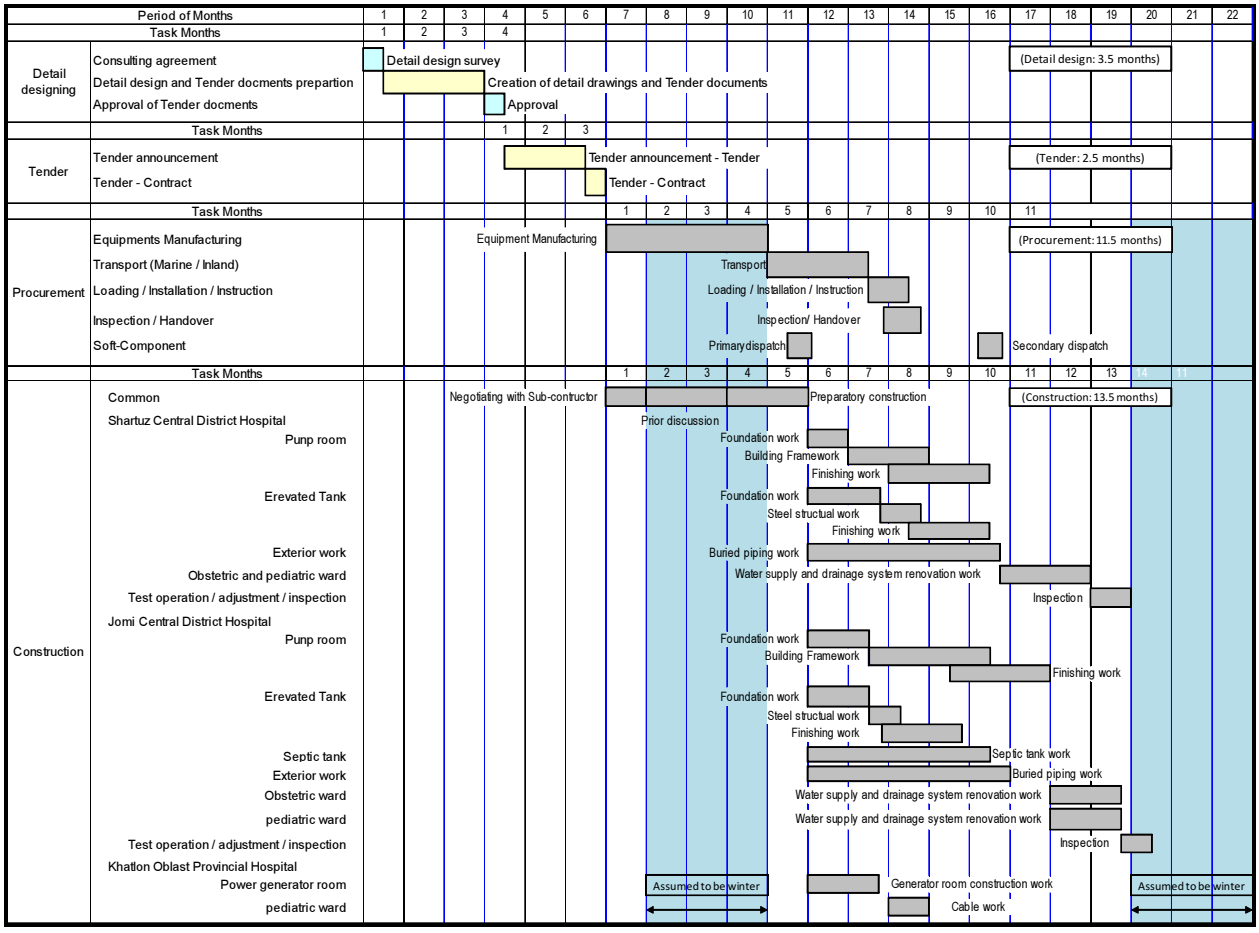


Figure 2.39 Project Implementation Schedule

2-3 Obligations of Recipient Country

Work to be done by the Tajikistan side and the timing of implementation are as follows:

Table 2.32 Work to Be Done by the Tajikistan Side and the Timing of Implementation

Item	Timing of implementation
(i) To secure land for the Plan and guarantee the ownership of the national government, the relevant local government or the Ministry of Health	Prior to conclusion of E/N
(ii) To remove obstacles from the land and level it before commencement of construction	After conclusion of E/N
(iii) To clear sickrooms in order for which system repair work is conducted	During implementation of the Plan
(iv) To bring the electricity into the delivery point on the premises	During implementation of the Plan
(v) To discharge products to be purchased for the Plan and swiftly conduct procedures for customs clearance and domestic transportation	During implementation of the Plan
(vi) To exempt Japanese corporations and citizens from customs, inland tax and other financial obligations in Tajikistan in relation to products and services to be procured in accordance with authenticated contracts	During implementation of the Plan
(vii) To guarantee to take measures necessary for members of Japanese corporations to enter and stay in Tajikistan to execute their services that are provided in accordance with authenticated contracts	During implementation of the Plan
(viii) To issue permits and licenses, without delay, necessary for implementation of this Plan	Prior to conclusion of E/N and during implementation of the Plan
(ix) To bear the handling costs and commissions of Authority to Pay (A/P) to be incurred in accordance with bank agreements.	A/P to be issued immediately after authentication of contracts by JICA
(x) To bear all costs necessary for this Plan that are not financed by Japan's grant aid cooperation	After implementation of the Plan

2-4 Project Operation Plan

2-4-1 Medical Equipment Operation Plan

Medical facilities, ranging from number hospitals operated by districts to the nationally-operated Diakov Hospital in the state capital Dushanbe, generally do not employ engineers to take charge of medical equipment maintenance. External agents are called for when there is a machine failure, as well as the need for repair and inspection.

Companies are required to obtain a license for the sale of medical equipment and another license for after-sales service. These licenses are granted by the Ministry of Health. Although there are many companies licensed for sales, those that can provide after-sales service are limited to about 5 companies listed below. Among these, Tajik Medical Equipment is essentially an entity like an independent administrative agency operating under the Ministry of Health. However, this company does not receive any money from the Ministry of Health, including wages of employees. It is operated using the same business mechanism as other private companies.

- Medtechnica
- Tajik Medical Equipment (Ajiktibtajhizot)
- MedConcept
- Taji Med
- Intermedpro

It is likely that the maintenance of medical equipment procured in this project will depend on these 5 companies for routine servicing, repair, and response to failures. The budget needed for operation, maintenance, and the response to failures must be secured, for example, by the use of the income from patients in the paid care scheme, which has been introduced at the Maternity Hospital No.3 and Khatlon Oblast Provincial Hospital.

2-4-2 Facilities Operation Plan

The water supply and drainage system in this Project can be operated, maintained and managed under the current management scheme and staff members, therefore, it is not necessary to recruit of the additional personnel.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

The table 2.33 is shown the necessary costs for implementing the Project and to be borne by the Tajikistan side. As for the cost information to be borne by the Japanese side is closed due to the confidentiality.

(1) Cost Borne by Tajikistan

The cost borne by the Tajikistan side is shown in Table 2.33.

Table 2.33 Estimated Cost to be Borne by Tajikistan Side

Cost Borne by Tajikistan 137,070 Tajikistan Somoni (approximately 2.3 million JPY)

Cost item of construction and Others	Cost (Tajikistan Somoni)
Shartuz Central District Hospital: Land preparation and leveling of planned construction site	12,330
Jomi Central District Hospital: Land preparation and leveling of planned construction site	83,370
Khatlon Province Hospital: Land preparation and leveling of planned construction site	4,700
Fees for the payment of prices to the consultant and the equipment procuring contractor	35,970
Fees for the issuance of Authorization to Pay (A/P) to the consultant and the equipment procuring contractor	700
Total	137,070

(2) Conditions for estimation

(i) Calculation as of : September 2012
(ii) Exchange rate : USD ＝ JPY 81.09
: TJS (Tajikistan Somoni) ＝ JPY 16.81
(iii) Procurement and Construction period : The detail designing, construction and procurement period is as shown in Project schedule
(iv) Others : The cost is estimated in accordance with the system of grant aid cooperation of the Government of Japan

2-5-2 Operation, Maintenance and Management Cost

(1) Medical Equipment

Physicians, nurses and other medical workers are the users of medical equipment and will handle daily maintenance and management of it. Currently, there are no technicians who specifically maintain medical equipment in medical facilities in Tajikistan. Individual facilities handle repairs or maintenance by entering service agreements with equipment manufacturers' agents in Tajikistan.

As Table 2.34 shows, the total annual maintenance cost of equipment to be procured under projects targeted by this cooperation for all target facilities is about TJS 250,000 (about JPY 4.2 million). A look at the expenditures of each medical facility reveals that 80 to 90 percent of gross expenditures goes toward labor costs. As of 2014, each medical facility is assured of securing money for this maintenance cost through next-year budget measures by the city, province or district that controls it and allocations from payment for medical services that generate payments.

Table 2.34 Estimated Annual Operation and Maintenance Cost for Medical Equipment

(Currency: Tajikistan Somoni)

Maternity Hospital No. 3 in Dushanbe

No	Equipment	Contract out	Q'ty	Spare Parts	U Price	Total 1	Consumables	U Price	Total 2	Total (1+2)
1	Defibrillator	9,000	1	Patient cable	1,800	1,800	Recording paper, etc	2,790	2,790	13,590
2	Patient Monitor	6,000	9	Patient cable	2,500	22,500	Recording paper, etc	3,030	27,270	55,770
3	Neonatal Monitor	6,000	2	Patient cable	2,500	5,000	Recording paper, etc	3,330	6,660	17,660
4	Ultrasound Scanner	9,000	2	-	0	0	Gel	160	320	9,320
5	Ultrasound Scanner (Portable)	6,000	4	-	0	0	Gel	140	560	6,560
6	Cardiotocograph	6,000	3	Patient cable	1,500	4,500	Recording paper, etc	1,540	4,620	15,120
7	Phototherapy Unit	0	2	-	0	0	Fluorescent lamp, eye mask	770	1,540	1,540
8	Colposcope	0	1	-	0	0	Halogen lamp	260	260	260
9	Infusion Pump	3,500	2	-	0	0	Infusion set	1,010	2,020	5,520
10	Syringe Pump	3,500	4	-	0	0	Extension tube, syringe	2,260	9,040	12,540
11	Infant Incubator	0	3	Heater	2,800	8,400	Filter	340	1,020	9,420
12	Binocular Microscope	0	2	-	0	0	Halogen lamp, oil	480	960	960
13	Spectrophotometer	9,000	1	Halogen lamp	500	500	Recording paper, etc	160	160	9,660
14	Centrifuge (General Purpose)	0	1	-	0	0	Test tube	170	170	170
15	Centrifuge (Hematocrit)	0	1	-	0	0	Capillary tube	1,600	1,600	1,600
Total										159,690

Khatlon Oblast Provincial Hospital

No	Equipment	Contract out	Q'ty	Spare Parts	U Price	Total 1	Consumables	U Price	Total 2	Total (1+2)
1	Neonatal Monitor	6,000	3	Patient cable	2,500	7,500	Recording paper, etc	3,330	9,990	23,490
2	Ultrasound Scanner	6,000	2	-	0	0	Gel	160	320	6,320
3	Phototherapy Unit	0	2	-	0	0	Fluorescent lamp, eye mask	770	1,540	1,540
4	Syringe Pump	3,500	5	-	0	0	Infusion set	1,010	5,050	8,550
5	Infant Incubator	0	2	Heater	1,800	3,600	Filter	340	680	4,280
6	Generator (25kVA)	12,000	1	Belt	2,000	2,000	Filter, fuel	1,360	1,360	15,360
Total										59,540

Number Hospital (for 1 Hospital)

No	Equipment	Contract out	Q'ty	Spare Parts	U Price	Total 1	Consumables	U Price	Total 2	Total (1+2)
1	Fetal Doppler	0	1	-	0	0	Gel	60	60	60
2	Generator (10kVA)	2,400	1	Belt	2,000	2,000	Filter, fuel	1,360	1,360	5,760
Total										5,820

(2) Water Supply and Drainage Facilities

Additional cost for water supply charges is not necessary to consider undet this Assistance Project because of Jomi Central District Hospital is using well water, and Shartux Central District Hospital is introduced the fixed price system. As for the cost of electricity is slighly increased from the current one. The additional costs for operation and maintenance of the water supply and drainage system which is introduing in this Assistance Project including cost for electricity will be allocated by the respective local government. It was already confirmed with the letters which issued by each hospital, that the respective local governments is going to allocate additional budget basaed on the estimated budget plan which was prepared by the Preparatory Study Team.

Table 2.35 Estimated Annual Operation and Maintenance Costs for Water Supply and Drainage System (Currency: Tajikistan Somoni)

No.	Expenditures	Jomi District Central Hospital	Shartuz District Central Hospital	Remarks
1	Electricity	340	110	・ Is slightly increased because of the project is planning to introduce water pump to the respective hospitals.
2	Public Water	—	—	There is no additional costs; ・ Jomi District Central Hospital is using the well water in the hospital. ・ Shartuz District Central Hospital is introduced the fixed price system (Monthly rate is 2,340 Tajikistan Somoni)
3	Maintenance of the related Facilities	5,430	2,340	・ Painting the interior and exterior of the facilities, elevated water tanks, repair of roofs, dipping up of the septic tanks, etc. ・ Indicated cost was calculated to as an annual expenditure.
Total by Site		5,770	2,450	
Total		8,220		

CHAPTER 3

CHAPTER 3 PROJECT EVALUATION

3-1 Preconditions

In order to implement this Project, the Tajikistan side needs to secure and prepare the planned construction site listed in Section 2-3 Obligations of Recipient Country, Chapter 2 of this report, before construction begins for Projects targeted by this Assistance Project. Also, the Tajikistan side needs to partially close down or transfer hospital rooms to be improved during the works on rehabilitations / constructions. In particular, hospital facilities to undergo rehabilitation / construction for water supply and drainage facilities are regularly used by an unspecified, large number of patients and their family members, not to mention hospital staff members. It is important to ensure safety and clearly identify and separate areas under construction within medical facilities from those in which facility users are active so that facilities can maintain their functions during the rehabilitation / construction and so that rehabilitation / construction can progress safely. Thus, the understanding and cooperation of the Tajikistan side in terms of rehabilitation / construction is an absolutely necessary condition for completing such works smoothly and on time as called for in the Project implementation schedule.

3-2 Necessary Inputs by Recipient Country

The main objective is to improve medical equipment and water supply and drainage facilities at existing hospitals and plans call for maintaining medical equipment and water supply and drainage facilities already in use. Medical equipment manufactured under the former Soviet Union may be replaced by medical equipment manufactured in Japan or in USA as well as EU countries, and cordial support through the implementation of soft components for sufficient guidance for operating and maintaining said equipment in addition to the equipment supplier is planned.

However, it is vital to proactively continue training physicians, nurses and other current hospital staff members so that they can maintain and improve upon appropriate techniques, and it is expected to be considered and its promotion by the responsible the Ministry of Health and respective hospitals.

Meanwhile, it is possible to maintain water supply and drainage facilities by continuing the daily maintenance work done at existing hospitals. However, a dedicated staff must be continuously hired for these maintenance activities. While target facilities currently employ a dedicated staff for those activities, from a long-term standpoint, they should secure successors and train them to fully understand the state of the facilities.

In addition, this Project is expected to produce synergistic effects by aligning with the project for Improving Maternal and Child Health Care System in Khatlon Oblast (planned for March 2012-March 2016), a Japanese technical cooperation project in Khatlon Province, the project for Improving Maternal and Child Health Services in Khatlon Province, a project which supported by KfW, and other support projects, it should be able to depend on Ministry of Health's leadership to coordinate between projects appropriately.

3-3 Important Assumptions

To produce and maintain results under this Project, two things are required at each medical facility: (1) the same size staff of specialists as the current staff of medical workers must be secured continuously; and (2) maintenance costs for facilities and medical equipment must be secured continuously by target hospitals and local governments that control them.

3-4 Project Evaluation

3-4-1 Relevance

This Project is to be implemented as a Japanese grant aid project, and it is deemed to be relevant for the following reasons.

(1) Targeted Beneficiaries

The city of Dushanbe and Khatlon Province, the targets for this matter, have populations of 700,000 people and 2.7 million people, respectively (around 36% of the total population, 2009), and Khatlon Province is the most populous of the three provinces in Tajikistan. Also, the Japanese technical cooperation project for developing medical workers and improving maternal and child health in Khatlon Province planned to last four years from March 2012 (Project for Improving Maternal and Child Health Care System in Khatlon Oblast) is being implemented, and this Project contributes to synergy with the aforementioned technical cooperation project. Maternity Hospital No. 3 in Dushanbe is one of the top referral hospitals in the city and also functions as an teaching hospital where training and such are administered for the medical workers of Khatlon Province.

(2) Project Goal

This Project strives to improve hospital environments and, in so doing, to help improve maternal and child health services at target hospitals by improving medical equipment and water supply and drainage facilities at Maternity Hospital No. 3 in Dushanbe and Khatlon Oblast Provincial Hospital, central district hospitals and number hospitals in Khatlon Province. The Project is expected to help improve and bring stability to people's lives and ensure that basic human needs (BHN) are met consistently.

(3) Consistency with Tajikistan National Population Health Strategy

The National Development Strategy of the Republic of Tajikistan for 2006-2015 ("NDS") was established, and in 2011, the National Health Strategy for the Republic of Tajikistan for 2011-2020 ("NHS") was developed as part of NDS.

NHS focuses on providing citizens with widespread, consistent maternal and child health services in the form of pre- and post-natal care, neonatal care and comprehensive management of infant illnesses. In addition, improving hospitals critical to regional health care (improving and upgrading Khatlon Oblast Provincial Hospital and other core hospitals in the capital of Dushanbe and Khatlon Province) is seen as the most urgent needs toward modernizing the hospital system. Projects targeted by this Assistance Project by which medical equipment will be procured and water supply and drainage facilities improved are consistent with these policies.

(4) Consistency with Japanese Aid Policy

According to the aid policy for Tajikistan set forth by the Japanese government in December 2012, the stability of Tajikistan is critical not only to the stability of Central Asia but also to the stability of all of Eurasia, and it is absolutely vital for efforts to form a global society with the aim of independence and stability for neighboring Afghanistan. With the realization that water supply, health care and other basic social service sectors have not been sufficiently established, this Project supports the establishment of water supply facilities that provide access to safe, clean drinking water and of health care systems (maternal and child health care, first and foremost) as one critical area (medium-term goal). Thus, this Assistance Project is consistent with Japanese aid policy.

3-4-2 Effectiveness

Implementing this Project should deliver the following results.

(1) Quantitative Effects

Table 3.1 Guidelines Indicating Achievement of Overall Project Goals

Table 3.1.1 Maternity Hospital No. 3 in Dushanbe

Guideline	Baseline (2011)	Target (2017) (three years after project completion)
Deliveries	6,138	6,775 (Note 1)
Inpatient newborns	6,427	7,039 (Note 2)
Obstetric surgeries	561	607 (Note 3)
Neonatal mortality rate (0-7 days after birth)	1.29%	Below 1.00% (Note 4)
Ultrasound examinations	5,823	7,633 (Note 5)
Referrals to other medical institutions	86	Reduce

Note 1: Expected figure for implementation of projects targeted by this Assistance Project (1.2%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.5%; this rate was applied to the baseline through 2017.

Note 2: This is the total number of newborns born within the hospital and those accepted from outside the hospital. Expected figure for implementation of projects targeted by this Assistance Project (1.0%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.3%; this rate was applied to the baseline through 2017.

Note 3: No major changes were seen in the number of surgeries between 2009 and 2011, so the figure of 561 for 2011 was set as the baseline and only the expected figure for implementation of projects targeted by this Assistance Project (2.0%) was applied to the baseline through 2017.

Note 4: The percentage of deaths from the figures determined in Note 2.

Note 5: Though fluctuations were observed between 2009 and 2011, the figure seems to be decreasing. Oral interviews clearly indicated that this is due to deteriorating equipment. Therefore, the expected figure for implementation of projects targeted by this Assistance Project (replacing deteriorating equipment) (annual growth rate through 2017) is set at 7.0%, and the goal is to recover the figures set in 2009 and 2010 (7,438 and 7,721, respectively).

Table 3.1.2 Khatlon Oblast Provincial Hospital (Pediatric Ward)

Guideline	Baseline (2011)	Target (2017) (three years after project completion)
Inpatients	2,710	3,074 (Note 6)
Infant/child mortality rate	1.4%	Below 1.0% (Note 7)
Ultrasound examinations	1,652	1,788 (Note 8)

Note 6: This is the total number of infants and children older than 30 days and younger than 15 years. Expected figure for implementation of projects targeted by this Assistance Project (2.0%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 3.3%; this rate was applied to the baseline through 2017.

Note 7: The percentage of deaths from the figures determined in Note 6.

Note 8: Expected figure for implementation of projects targeted by this Assistance Project (annual growth rate through 2017) was set at 2.0% and applied to the baseline.

Table 3.1.3 Central District Hospitals (2 Facilities)

Guideline	Baseline (2011)		Target (2017) (three years after project completion)	
	Jomi Central District Hospital	Shartuz Central District Hospital	Jomi Central District Hospital	Shartuz Central District Hospital
Deliveries	4,514	3,685	4,886 (Note 9)	3,989 (Note 9)
Pediatric inpatients	1,330	1,048	1,428 (Note 10)	1,126 (Note 10)
Percentage of water supplied within the facility that satisfies water quality standards	-	-	100% (Note 11)	100% (Note 11)

*Notice: This takes into account the synergistic effects of technical cooperation projects currently being implemented.

Note 9: Expected figure for implementation of projects targeted by this Assistance Project (2.0%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 3.3%; this rate was applied to the baseline through 2017.

Note 10: This is the total number of infants and children older than eight days and younger than 15 years. Expected figure for implementation of projects targeted by this Assistance Project (0.5%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 1.8%; this rate was applied to the baseline through 2017.

Note 11: Water quality standards are standards for drinking water set forth by Tajikistan and WHO.

Table 3.1.4 Number Hospitals (5 Facilities)

Guideline	Baseline (2011)	Target (2017) (three years after project completion)
Deliveries	1,652	1,823 (Note 12)
Pediatric inpatients	447	484 (Note 13)

* Names of the five Number Hospitals: J No. 1: Jomi No. 1 District Hospital; J No. 3: Jomi No. 3 District Hospital; R No. 1: Rumi No. 1 District Hospital; R No. 2: Rumi No. 2 District Hospital; S No. 3: Shartuz No. 3 District Hospital

Note 12: Expected figure for implementation of projects targeted by this Assistance Project (1.2%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.5%; this rate was applied to the baseline through 2017.

Note 13: Expected figure for implementation of projects targeted by this Assistance Project (0.7%) added to population growth rate (1.3% from 2000-2009) for annual growth rate of 2.0%; this rate was applied to the baseline through 2017.

(2) Qualitative Results

- Enables early detection and treatment of disorders of expectant and nursing mothers and newborn/pediatric illnesses.
- Improves working environment for medical workers, improves the quality of health care services for nursing and expecting mothers and newborns and children.
- The clinical training environment at Maternity Hospital No. 3, a critical hospital for such education training, is improved by the replacement and improvement of deteriorating medical equipment.
- The ability to consistently supply safe water throughout the year through the establishment of water supply and drainage facilities improves the hospital environment and the working environment for medical workers and improves the quality of health care services offered to patients.